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Machine-Tool and Shop-Equipment Tendencies

By the Editor

THE railroads have had anything but an easy task in recent years. With income restricted because of the regulation of freight and passenger rates, with rising labor costs, with steadily mounting taxation, and facing serious competition for both freight and passenger business, the struggle has indeed been a desperate one.

Army officers have instilled into them at West Point something of the philosophy of General Grant—"Never over-estimate the strength of the enemy." Were it not that the railroad organizations were dominated by some such philosophy they could not have so fearlessly and successfully overcome the desperate odds in 1923, when almost in the face of disaster they entered into an improvement program which meant not only the building up of a high state of morale, but the expenditure of literally billions of dollars for capital account over the following five years; this in spite of the fact that they were not allowed to earn anywhere near what Congress and Interstate Commerce Commission designated as a reasonable rate of return upon a low tentative valuation.

Apparently the legislative and regulating authorities believed that they must, like the Spartan father, either kill the weakling off or see it grow and develop under harsh and what in this day and generation would be regarded as unnatural or even inhuman methods.

Today the railroads are setting a pace which is far in advance of that of the average American business or industry. This is being reflected in no uncertain manner in the administration of their mechanical departments. The slogan of the operating department is to "keep the cars moving." This means that the locomotives and cars must be maintained in a high state of efficiency. The mechanical department, which formerly was regarded more or less in the light of an orphan or a neglected stepchild, has come into its own. Naturally it must show real results for every dollar expended, but on most roads it is no longer starved until it has become indifferent or anæmic; it is no longer regarded as a fifth wheel or a non-productive factor.

The "improvement minded" officer or supervisor (we acknowledge credit to President George Hannauer of the Boston & Maine for this pointed expression) is enabled to think in larger terms than homemade shop kinks, and is facing up to his task in a bigger and more masterful manner, since he has to a greater degree than ever before the support (financial and otherwise) of his management. Not that this is altogether true in all cases, nor that many managements have advanced as far in this respect as might be desired.

Nevertheless, the average mechanical-department executive has been granted a far greater degree of authority and responsibility than was his even a few years ago. The results are evident in the improved equipment, both as to design and maintenance. Where wrecks caused by defective equipment were frequent not so many years ago, today they are few and far between. Even hot boxes and draft-gear failures are becoming so unpopular that they, too, may soon be a thing of the past. The rest of the railroad plant has, of course, had its share in this improved performance, but we speak now of the mechanical department only.

Objectives of This Number

The *Railway Mechanical Engineer* in its Annual Shop Equipment Numbers has for many years focused attention on problems concerned with shop facilities and equipment. Until recently it has each year considered in these numbers a few specific problems, which at the time appeared to be of outstanding importance. The articles in a given number were thus not necessarily related.

Last year, for the first time, all of the special feature articles were directed to problems involved in the selection, purchase and handling of machine tools. The reception accorded it was so cordial and enthusiastic that this year we are emboldened to use the same general method of approach, the objective this time, however, being to indicate what the future attitude of the railroads will be toward modern mechine tools and shop

equipment, based on the present attitude of those railroads now in an advanced position in this respect.

Two Surveys Made

To accomplish this purpose our editorial staff has recently made a survey of shop conditions on a number of railroads—fourteen, to be exact. Then, because the machine-tool builders have some shop production problems not entirely unlike those in a railroad repair shop, and because, as builders and merchandisers of machine tools they may be expected to possess an expert knowledge of how best to handle their own machine-tool and shop-equipment problems, we have made a survey of conditions and methods in the plants of several representative machine-tool builders. We shall not attempt here to sum up these two surveys—they speak for themselves and contain much of interest and practical value to the railroad officer who is interested in efficient, economical and effective maintenance and repair practices.

Industry and Transportation Intimately Related

Entirely aside from these surveys, one thing must be evident to thoughtful railway officers, and that is, that the rapidly changing economic conditions in this country in recent years make it necessary for them to be keenly awake to their own peculiar problems—knowing and understanding the exact facts about the operations and costs, and the possibilities of improvement, and studying carefully the tendencies, not only in their own departments and on their own roads, but in the railroad and industrial world generally. Demands for service and standards of service seem to change almost overnight. Developments in the industrial and commercial world go forward by leaps and bounds. The railroads are an integral and vital part of the great modern industrial organization, with its mass-production methods, its intricate problems of distribution and its high-pressure merchandising practices.

Railroad officers (and this includes department officers and supervisors) cannot remain isolated on the basis that their tasks are entirely different from those of other industrial and manufacturing organizations. They can learn much from these concerns in the way of methods, practices, tools and equipment. They can at the same time help to cultivate better relations with the railroads' patrons and shippers by visiting their plants and getting better acquainted with them.

Constructive Suggestions from the Outside

Partially for these reasons, we present the article "Plant Engineer Looks at Railroad Shop." It was prepared by an engineer now engaged in automobile production, but who has had railroad shop experience. It is written, therefore, in an understanding and constructive way that we believe will not only be exceedingly helpful to our readers, but will be appreciated by them.

As in the two articles previously mentioned, emphasis is placed on the need of a department which will specialize on shop engineering problems and the study and care of machine tools. Distinct advance has been made in this direction by not a few railroads, some of which established such departments many years ago, as readers of our predecessor, the American Engineer and Railroad Journal, will recall. Not all mechanical departments, however, have fully caught a vision of the possibilities.

Shop scheduling systems! For at least a quarter of a century this journal and its predecessors have fought for their introduction. It was a long, hard battle, but today shop scheduling systems are generally used, in some form or another, in all progressive railroad repair shops. That all is not quite as it should be, however, and that there are still great possibilities of perfecting shop scheduling systems, may be inferred from the Plant Engineer's statement that, "One or two of the railroad shop scheduling systems that it has been my privilege to observe, seem to be designed to provide a rather elaborate collection of alibis for the different departments, as to why they failed to meet the schedule." A fair criticism for certain applications, no doubt, but we do know of several shop scheduling systems that are simple and effective and which almost unerringly discover weak spots, thus making it possible to strengthen them and speed up production along sound lines.

Shop Transportation

As far back as we can remember, ambitious mechanical-department officers have been studying the rearrangement of shop tools to facilitate production and reduce costs. This has been quite evident where certain shops have been visited at intervals of a few years.

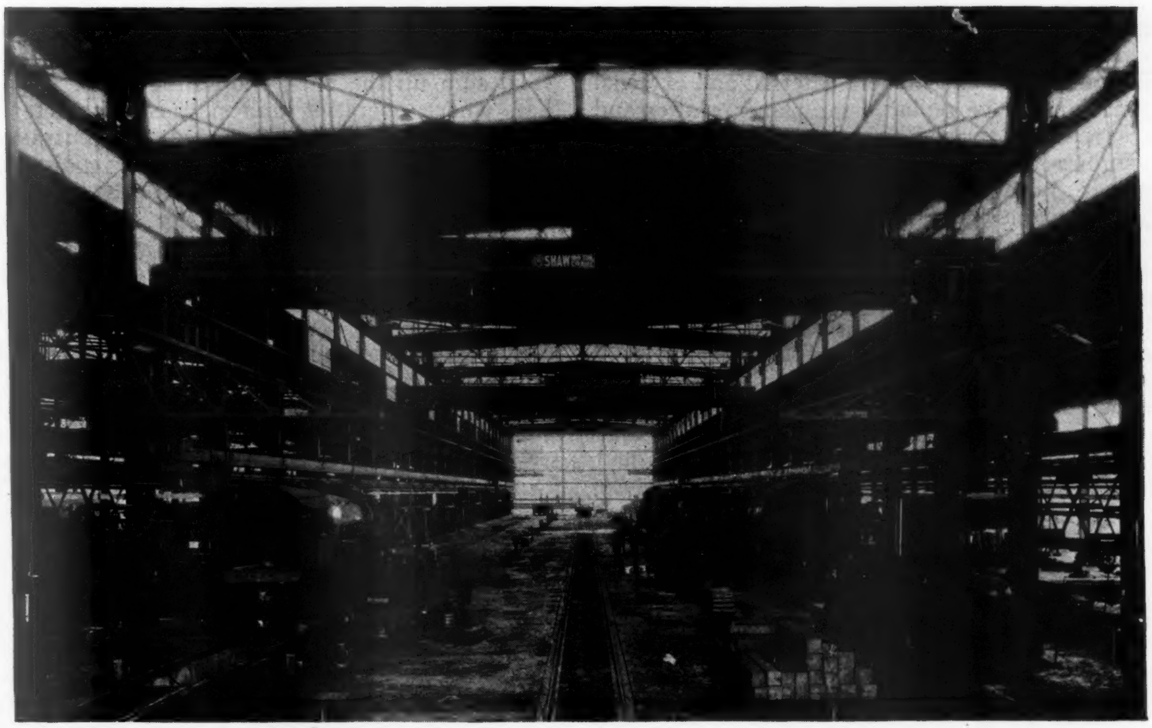
Closely allied to this, and a part of the same general strategy, progressive officers have continually experimented with and adopted material-handling apparatus of one kind or another, as it has been developed. The railroads have not been far behind the industries in taking advantage of these things, except that the nature of some of the industries is such that they can use them more extensively.

It was our own organization, "The House of Transportation," as the Simmons-Boardman Publishing Company has been designated, that published the first and only material-handling cyclopedia. The use of material-handling apparatus is steadily expanding in all industrial operations and the railway mechanical department should follow developments closely, since as "Bill Babbitt" so patiently explained to "Highball Scott," "In a railroad shop we have a transportation system within a transportation system." For this very reason railroaders should be the most alert to arrange and co-ordinate properly their repair-shop practices and utilize material-handling apparatus wherever it is advantageous.

Our old friend, "Bill Babbitt" gets this over to "Highball Scott," the master mechanic, in his characteristic way and in the form of homely philosophy which is easy to read and grasp—a contrast to what some of our friends refer to as our highbrow editorial treatment, which apparently does not always register quite so effectively as we had hoped for. "Bill" is a good friend of ours, but we still maintain that we can say the same thing in lots less words, if not quite so effectively.

Modern Methods of Finishing

One of the most perplexing problems in the maintenance of passenger cars has been to increase the durability of the finish and to reduce the length of time in the paint shop, as well as the labor cost of applying the finish. A comparatively heavy investment was believed to be warranted, if even a small part of this long period could be saved or the life increased. Then came the spray application of finishes and the modern finishes which are now so generally used on automobiles. These can be easily applied and require only a very small percentage of the time compared with the older methods. There has been one uncertainty in relation to the general adoption of these finishes by the railroads for their passenger equipment—the question of safety and the fire hazards in the finishing shop. Fortunately these hazards can be largely, if not entirely, eliminated. One of our feature articles deals with this problem.



How Changing Conditions Affect Shop Equipment

Concentration of repair work is necessitating the installation of modern shop facilities

THE railroads of the United States are passing through a period of transition in which important changes are taking place affecting the policies of motive-power and rolling-stock maintenance. These changes are prompted in part by newly developed methods in the operating departments and by the necessity of maintaining equipment to higher standards and at the same time of performing the maintenance operations with a reduction in time and cost.

In order to present as up-to-date a picture as possible concerning these factors which have a bearing on the shop equipment problem, the *Railway Mechanical Engineer* has, within the past three months, made a first-hand study of conditions on 14 representative railroads operating in territory covering practically the entire country. The railroads in question cover 58,520 route miles, operate and maintain 16,528 locomotives, 620,500 freight cars and 16,464 passenger cars. The conditions as presented represent the character of the practices and the attitude toward shop facilities on these roads only but it is believed that the similarity of methods indicates a definite trend toward certain factors which have an important bearing upon the machine-tool and shop-equipment problem.

During the past seven years the railroads of this country have abandoned 78 locomotive shops and 271 engine terminals. This has been the natural result of such operating factors as the extension of locomotive runs and the inability of small, poorly equipped locomotive shops to overhaul motive power with the same facility and degree of economy as the larger, better equipped shops. There is, therefore, a tendency to concentrate repair work at shops which are strategically located in relation to the operating characteristics of the different roads and which, at the same time, are sufficiently in keeping with modern ideas of layout to make it economical to modernize the facilities.

The application of this tendency to concentrate or centralize heavy repair work seems to take definite form in relation to the size and physical character of the railroad. On one road studied, involving only about 400 route miles and approximately 325 locomotives, all of the classified repair has been concentrated at a single modern locomotive shop on the system and the smaller shops at outlying points abandoned. When it was decided to centralize all repairs at the single point, an extensive program of machine-tool rehabilitation was inaugurated as a result of which the shop, at the pres-

ent time, is equipped with modern machine tools, practically none of which are over ten years old. Heavy-duty milling machines and modern internal and external grinding machines have replaced the planer, slotter and the older types of general-purpose tools. Wherever accurate studies indicated the wisdom of such a course, machines were installed which would produce locomotive parts on a quantity basis but, owing to the relatively small number of locomotives, machines of the fully automatic type are not to be found in this plant. The turret lathe, with modern tooling equipment, has taken much of the work away from the engine lathe where it can be economically tooled up for the production of small lots. The mechanical officer of the road in question has stated that there has been a reduction in the cost of locomotive repairs per locomotive-mile and an increase in the assigned mileage between classified repairs largely as a result of the installation of modern machine tools and material-handling equipment.

On one of the larger roads, involving over 5,500 miles of line and 2,400 locomotives, the repair work has been centralized at three important shops one of which has been especially equipped to handle a specific type of locomotives. The largest of the three shops has been organized as to personnel and facilities much on the order of a manufacturing shop, by which is meant that a large part of the shop operation is devoted to the production of locomotive parts in quantities, for shipment to outlying points. These shops are equipped with the most modern production machines, including many automatics which turn out such parts as may be made from iron, steel and brass bar stock and manufacturing such parts as cylinder packing rings, piston-valve rings and piston-valve bushings.

On all but two of the roads included in this survey there has been a decided move toward concentration of repair work. The two exceptions were roads having operating and physical characteristics so radically different from the others that the maintenance problem must necessarily be solved in other ways. On one of these two roads, covering a broad expanse of territory involving 8,000 route miles, the 2,300 locomotives in service are given heavy classified repairs at three large strategically-located back shops while the lighter classified and running repairs are handled at a number of well-equipped smaller shops which, in many cases, may best be described as "combination engine terminals and back shops." This road has built a number of new shops to handle lighter classified repairs and has recently built a new heavy repair shop involving an expenditure of over three million dollars. It is interesting to note that in building new shops at several points on the road to replace obsolete facilities, all of the old machine tools were retired and the new buildings were equipped with modern tools capable of the maximum output of modern tool steels.

Material-Handling Equipment

Several of the roads surveyed have made elaborate studies of the problem of handling and transporting parts and materials. Electric hoists on individual cranes and additional installations of travelling cranes have served to reduce the handling of parts in process of manufacture or repair in the main shops. Motorized delivery systems have been installed to place materials at the point of use and have served to eliminate the expensive and time-consuming method of handling parts by manual labor. In many shops electric platform trucks are now used to handle parts and materials which were previously loaded on skids. Mechanical officers indicate that they recognize the possibilities of substantial economies by modern material-handling methods.

To sum up the back shop situation it may be said that, where operating and physical characteristics of the road permit, there is a tendency to centralize repair work at a smaller number of better equipped shops. These shops are being equipped with the best of modern machine tools and the shops are being organized to manufacture locomotive parts in quantities, either for shipment to outlying points or in order to have such parts on hand before the locomotives are taken into the shops for general repairs. In some cases the experiment is being tried out of working far enough ahead on the production or repair of parts so that sets of principal parts, such as rods, driving boxes, spring rigging, motion parts, etc., are on hand when the locomotives arrive at the shop so that several days are cut off from former heavy classified repair schedules.

The Engine Terminal

The extension of locomotive runs has probably been one of the most important factors in prompting certain changes that have taken place in engine-terminal methods and facilities in the past few years. Needless to say, this factor has undoubtedly had much to do with the abandoning of many of the 271 engine terminals that have been closed since 1922, and the many others which have been reduced to the handling of yard engines and road locomotives in purely local service.

With the necessity of a higher standard of maintenance came the practice of making periodical repairs, in most cases at 30-day intervals. The evolution of this practice may be seen in an experiment, now being tried out on one road, of reconditioning locomotives every 90 days irrespective of their immediate requirements. The program includes the removal of all rods, boxes, running gear and motion work and putting the parts in first class condition with the object of eliminating, if possible, all locomotive failures and minor running repairs during the 90-day intervals.

With a single exception, all of the roads included in this survey are concentrating running repairs and servicing locomotives at fewer terminals and, coincident with this practice, there is a decided tendency to equip engine terminals with better shop facilities. The engine terminal in years gone by has usually been looked upon as the place to send machine tools which have outlived their usefulness in the back shop. Today the engine terminal has assumed a position of sufficient importance in the operating scheme to warrant real study of the problem of laying out and equipping the machine shop with carefully selected new machine tools. The attitude of many mechanical officers at present is that a machine which can no longer serve the back shop efficiently has only one destination—the scrap pile.

Because of the fact that the older type of engine terminal did not receive much attention when new facilities were being considered, it is evident that a great deal of progress in methods should be observed. One of the most fertile fields for the improvement of material-handling methods was in and around the engine house. Because of the nature of construction, overhead crane facilities were usually out of the question. The electric crane truck has solved a most difficult problem in eliminating arduous manual methods in transporting materials and handling parts during repair work. In some engine houses of existing construction, where space between the stalls is limited, overhead monorail hoists at each stall handle the material or parts along-

side the locomotives and into the outer circle, where electric trucks can operate conveniently.

The Car Shop

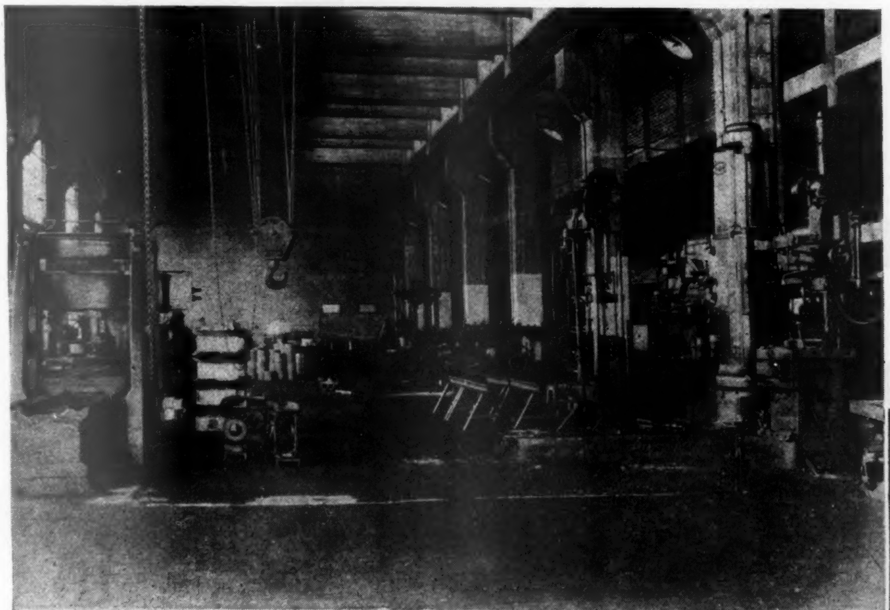
Probably the most radical change that has taken place in the character of maintenance work within recent years has been the adoption of some form of the progressive system of making freight car repairs by practically all important roads. Owing to the fact that larger numbers of cars of a single type are concentrated for repairs, this change has been a factor in the elimination of many small car-repair points. Most of the larger roads have not only specialized freight car repairs with respect to types of cars but there has been a tendency to specialize the repair work at different points on the road with the idea of obtaining maximum output by equipping specific repair points for the repair of a given type of car. The concentration and specialization of repair work has permitted the utilization of many of the facilities that have served well in other departments. Unfortunately, except at points where large permanent car-repair shops have been adapted to the progressive system, the car department seems to have been obliged to rely upon many inefficient, home-made tools. This has been particularly true in the case of many air-operated forming and bending devices. Substantial economies may still be effected by the installation of adequate machine equipment at freight car shops, particularly those making steel car repairs.

On some of the larger roads there is a tendency to fabricate many steel car parts at central shops for shipment to outlying points as well as to purchase fabricated parts from outside sources.

One very important phase of freight car repair work which indicates the need of special study is that of material handling. Some of the more progressive roads have solved this problem, especially in connection with the repair of open-top steel equipment by the construction of permanent concrete roadways or floors at the repair shop to permit the use of electric crane trucks.

Passenger Cars

Owing to the relatively small amount of equipment involved, passenger-car repairs are usually carried on at one shop point, unless the system is unusually large. The indications now are that many railroads have about reached the point where more machinery and equipment must be installed for handling passenger car repairs. Much of the present all-steel equipment has reached a point where corrosion and deterioration of side sheets, posts and braces now, or soon will, necessitate extensive repairs. This will require the installation of punching, shearing and forming machinery in many of the shops to take care of this work, with the alternative that formed parts may be purchased from outside sources. The repair of steel passenger cars is also involving an increasingly large use of welding operations.



Left: A modern engine-terminal machine shop

Right—Freight car shop operated on the spot system

The Transportation Problem of the Railroad Shop*

THE booster luncheon of the Rockside Better Business Bureau had been a highly successful affair. Mr. Alonzo Slick, who made a prosperous livelihood organizing this and similar business associations, had cultivated an abundance of good cheer through sundry songs, read from leaflets, by his guests. By repeated hand shakings and back pattings, he had many of his guests in that happy mood where gold bricks and sure thing business opportunities are readily exchanged for cold, hard cash.

Slick had allowed his imagination full sway in outlining the possibilities of Rockside as a commercial center, were the town possessed of a properly functioning Better Business Bureau. He called attention to the potential hydro-electric resources of Carbon Valley. He visioned the untold mineral wealth, which, for all his hearers knew, might lie beneath their very feet. He intimated that the brand of sunshine with which Rockside was favored was unequalled any place upon the face of the earth. And the transportation industry, that mainstay of civilization, and those stalwarts who regulated the functionings of the great transportation machine. He lauded the Carbon Valley Railroad's representative, Highball Scott, master mechanic, Rockside shops, in a manner unfamiliar to the ears of that hard-working shop executive.

Tom James of the Commercial Engineering Company was driving through that day and had stopped to say hello to his railroad friend. Bill Babbitt, ex-supplyman, proprietor of Evergreen Nursery Farms, who was in town that day, had also taken a few moments to see friend Scott. Thus it came about that James and Babbitt were present at the Better Business Bureau booster luncheon, the guests of Highball Scott, who, as one of the prominent citizens of Rockside, had been requested to aid in the organization of the Better Business Bureau.

"Fellows," said Highball, as the three stopped in his office after lunch, "we must admit that, although Mr. Slick's statements may sound over enthusiastic, Rockside has a future and also that transportation is one of the mainstays of our highly civilized nation."

"Right you are," said Bill, "and I'll farther commit myself by stating that it is my honest belief that the stranger in your midst, Mr. Slick, could sell fur coats in the region of the equator, and electric refrigerators in the polar regions. How did he sound to you, Tom?"

"Sounded to me that while the gentleman's speech would indicate that he had but a single thought at heart—the future of Rockside—his underlying motive was to sell a nickel-plated, ready-to-run Better Business Bureau to the denizens of Rockside for a good stiff price of admission."

"He did lay it on thick," said Highball, "particularly the importance of the transportation industry. He is here to organize a Better Business Bureau, sure enough, but at the same time he put me to thinking of this transportation industry from the angle of the outsider. I never realized what transportation meant until he showed how the milk, pure and fresh from the contented cow

* This is one of the series of stories written by a railroad man who was once a pedlar.

"Correct, Highball. Now what is the business of a repair shop?"

"Maintenance of equipment, of course."

"Right again. In repairing equipment our two principal items are labor and material. Each and every piece of material used in your shops, as well as each piece of material prepared for future use and stored, awaiting the time of its application, must be handled. In some cases, a number of times. Therefore, in the railroad shop, we have a transportation system within a transportation system. That is what I am getting at—the handling of material within the repair shop. May we discuss it without offense?"

"Discuss it as far as you like. I believe you realize that I stand ready to welcome any suggestion that you may see fit to offer for the improvement of shop conditions."

"Material must be handled and re-handled. There is no way of avoiding it. But it is possible there are many ways of effecting improvements," replied Bill. "What do you think, Tom?"

"It is a very important part of manufacturing operations, I know," replied Tom. "Just how far material-handling methods have been considered in repair shops, I am not prepared to say. Possibly I do not entirely grasp your meaning."

"Let's go back to the transportation system as a unit again," answered Bill. How did transportation develop in our fair land? Probably game animals such as deer or buffalo, in traveling from valley to valley to find the best grazing selected the lower points of the divides and skirted the swamps. Incidentally they angled up and down the steep hillsides and avoided the deep ravines. The Indian, in quest of meat, followed the game trails, as they afforded the easiest

on a farm along the Carbon Valley, was quickly and surely carried to the city to save the precious life of the under-nourished child of the tenements."

A Look at Shop Transportation

"'Pears to me," retorted Bill, "that the transportation industry in many cases would be benefited by a little scrutinizing, say from the inside."

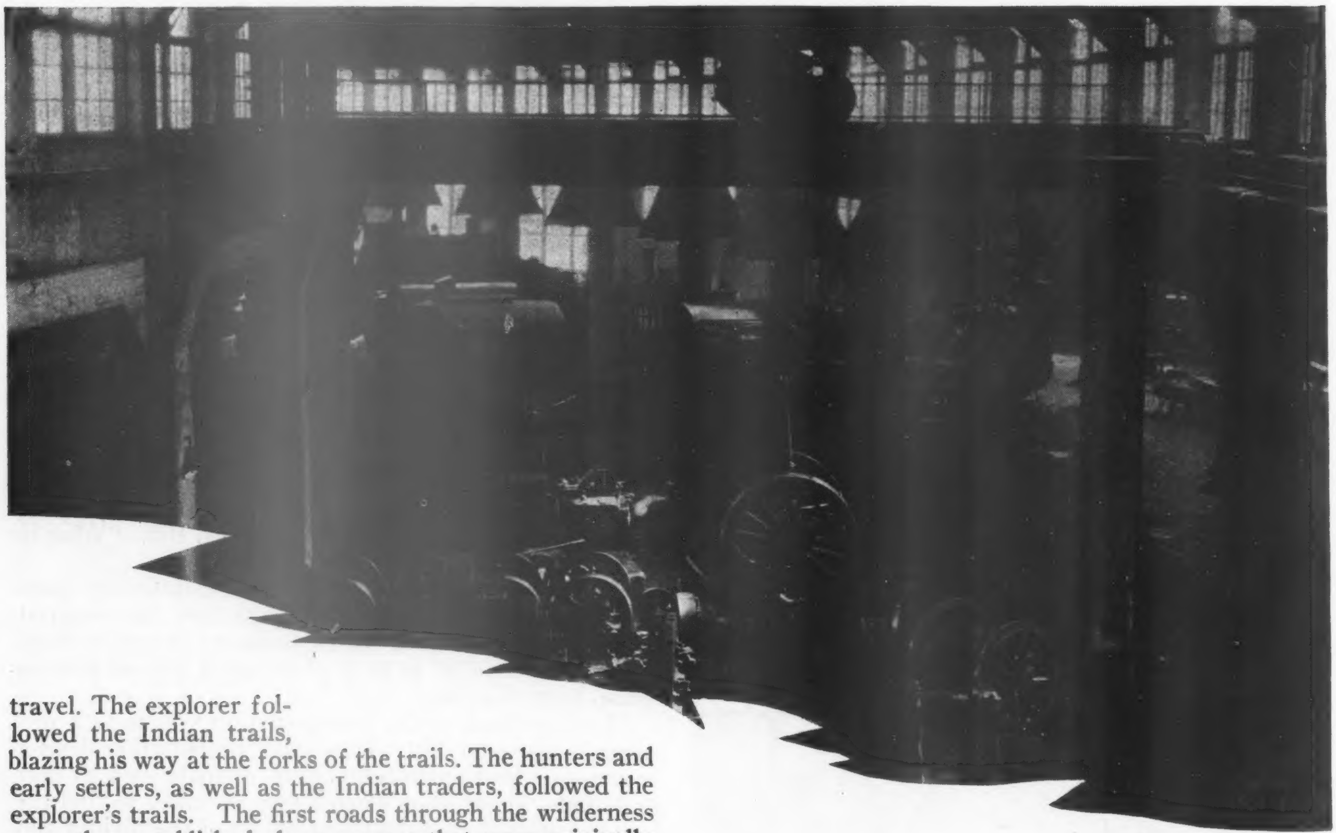
"Meaning, what, Bill?" queried Highball.

"Did you ever consider the possibilities of transportation directly under your own jurisdiction?"

"Certainly have," was the reply. "I do nothing else every day of my life but consider transportation. I would have you know, Bill, that the man who keeps the transportation system supplied with power has to consider transportation every hour of every day that he is on the job."

"Let's analyze transportation a bit, Highway. Just what does it mean?"

"Aside from passenger business, it means moving various commodities from point to point."



travel. The explorer followed the Indian trails, blazing his way at the forks of the trails. The hunters and early settlers, as well as the Indian traders, followed the explorer's trails. The first roads through the wilderness were thus established along courses that were originally laid out by wild animals. As the country was cleared, trails were straightened, streams bridged, and passable roads finally provided. On the heels of the conestoga wagons and prairie schooners came the builders of the canals and the railroads. As neither a canal nor a railroad could be built along the path originally trodden by the deer and buffalo, establishing routes between principal points now became a matter of calculation and planning, instead of mere chance. Even to this day the transportation lines are steadily improving their properties. Mountain ranges are pierced by tunnels at altitudes lower than mountain passes utilized by the original lines. Curves are straightened and better grades sought. Still the end is not in sight.

"On the other hand, is the movement of materials through a repair shop, like your own for example, the result of calculation to secure the best haul at the least expense, or is it a matter of following a trail established by chance?"

"Possibly it is largely a matter of chance, Bill, yet I don't entirely see where there is much room for improvement. What do you think, Tom?" inquired Highball.

"Just how far production-plant methods are applicable to repair shops, I would hesitate to say. I will say this, however, that in planning a manufacturing plant, the first thought is the material which is to be manufactured. A route is planned for this material from the time it is received in the raw state on the premises until it is placed in the cars at the shipping department. Every move is planned to reduce material movement to a minimum, as well as to eliminate as far as possible any manual operations in handling it."

"Yes, I know," said Highball. "In an automobile plant, for example, all of the products in the plant move to the proper stations at the assembly line until the single frame member, which is first laid down, grows into a completed machine which is driven off the line under its own power. But that system would not fit in a repair shop."

"No," said Bill, "not any more than a hard surfaced road for automobile travel would need to be laid out like a railroad line. On the other hand, a forest trail would make darn poor motoring. Now the question is, how do your shop transportation methods compare with the transportation industry as a whole? Are you still following the game trial? Have you gotten up to the travel on a cindered road, or are you on a par with the modern boulevard? How many back hauls do you make on a piece of material in the course of repairs? Are your shop tools arranged to suit the progress of the work, or must the work be criss-crossed through the different departments to suit a haphazard shop layout? Is your equipment on the order of the ox cart, or have you a modern high-speed truck? Are the units which you transport handled in container lots, or are they carried in bulk and laboriously loaded and unloaded by hand at each station?"

The Wanderings of a Crosshead

"A lot of questions to answer, Bill! For example, some particular piece now."

"Well," answered Bill, there is a man going by with a crosshead body on a truck. Let's watch him and see where he goes. Is he taking that crosshead over to a lathe to have a new wrist pin fitted? Where did he get that crosshead? Likely from the radial drill where the pin hole was reamed."

"Suppose," said Tom James, "we make a little diagram of the travels of that crosshead through the shop. First stripped from the locomotive. It is then taken to a lye vat for cleaning. How far away is that, Highball?"

"About one hundred feet."

"Towards the machine side?"

"No, in the opposite direction."

"How transferred?"

"Two-wheeled truck."

"After it is cleaned it starts back from the lye vat to

the machine side. Say two hundred feet. Where does it go first?"

"All depends. Possibly stops along the way at the fitting gang to have new shoes put on."

"All right. Then where? And, first, how far is this additional side trip to the fitting gang?"

"Say fifty feet."

"Next it should go to a drill press and be drilled and reamed. How far to the drill press?"

"Say seventy-five feet."

"From there it comes into the machine shop. Where next? Hauled to a lathe to fit the bolts? How far is that?"

"Well, another fifty feet at least."

"You have hardly made a good start yet, and you have loaded it on a hand truck four or five times and hauled it by man power all the way," said Tom. "There is a pin hole to be reamed, too, I suppose? Possibly it gets a new piston? Probably it goes to the planer to have the new shoes trued up after they are in place? Possibly not. I don't know how you handle such cases, but this is just one example. Now, Highball, how many times would you handle such a job from the time of stripping it from the engine until it is again ready for delivery?"

"Well, quite a few times."

"Still, that is only a crosshead. Driving boxes are great travelers too, are they not?"

"Yes, they require a great deal of handling."

"And they are heavy, too? Now to get all this talk analyzed down to a single point,—why all this transportation? Is it on account of the arrangement of the machines? If so, why are the tools so arranged?"

"I don't know, Tom. They were here when I came."

"Isn't it a fact," queried Bill, "that some of the older generation liked to see tools segregated in a shop? A section for lathes; one for planers. Drill presses in a similar manner. Isn't it also true that machines were located to suit the line-shaft drives of the shops? Location may not always seem so important, yet I once saw two machines that were glaring examples of wrong location. Either machine would do a given piece of work in thirty minutes. However, when the job in one machine was being changed, all of the space between the two machines was occupied for ten or fifteen minutes. Thus, the second operator waited, unless the finish time alternated. Then the number of men required to handle the work to and from the machines ran up a labor cost greater than that of the machining operation. Here were high-priced tools bought to speed up output, but limited by location. Add together the operator's wages and the handling cost and you have a total cost per piece way beyond that of a less expensive machine properly located. All adds up in cost per mile for repairs too."

"Sure enough. Do you think, on the other hand, Bill," questioned Highball, "that the labor of transferring crossheads in the manner we have mentioned is sufficiently expensive to justify changing our repair shop equipment in order to save hauls?"

"Not entirely, but there are other reasons. Tony, who pusha da truck, does not receive an exorbitant wage for his services, but does the expense stop with Tony? I'll venture to say it does not. Jake, who wants that crosshead for the 251, makes a trip to see how soon it will be ready. He finds it at the drill press. It is reamed, ready to fit the pin. George at the pin lathe knows he has a pin to fit, but sees no crosshead. Jake tells him the pin hole is reamed and ready. George advises Tony. Tony at the time is hauling some driving boxes on an order and finishes that job first. He then moves the crosshead from the drill press to the pin lathe. It takes Jake's and George's time to get Tony to deliver the crosshead to the lathe. Incidentally, the 251 in that particular respect stands in a state of suspended animation until Tony trundles the crosshead over from George's lathe.

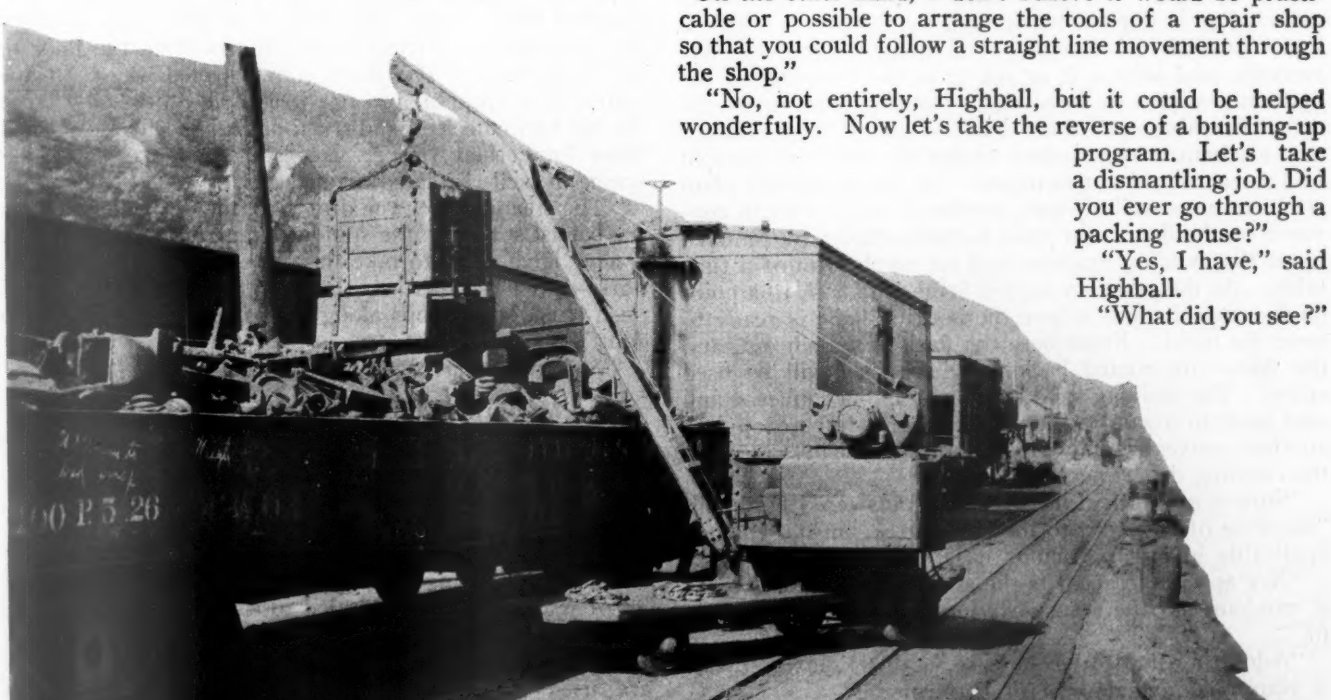
"You know, Tony's labor in handling that crosshead is somewhat like buying a secondhand automobile. The first outlay is merely incidental. Now you could extend that thought a long way and still see ample room for savings in the transportation business."

"I admit there are possibilities," answered Highball. "On the other hand, I don't believe it would be practicable or possible to arrange the tools of a repair shop so that you could follow a straight line movement through the shop."

"No, not entirely, Highball, but it could be helped wonderfully. Now let's take the reverse of a building-up program. Let's take a dismantling job. Did you ever go through a packing house?"

"Yes, I have," said Highball.

"What did you see?"



"Well, I saw the critter come in under its own steam, tapped on the dome, swung up on a trolley, and taken apart with all the works removed, by the time it got to the other end of the trolley."

"In other words," said Bill, "the operation of routing or handling material through a shop will work either way; either forward or backward. In the automobile plant the units all converge at the assembling line and the tin horse romps out under its own steam at the other end. In the packing plant, the critter rushes in under its own steam and travels out through the various departments under any form you might imagine, from a nice juicy tenderloin steak or a cake of highly scented toilet soap to a sack of fertilizer that would chase a dog out of a tannery."

A Start at the Source

"Now," continued Bill, "most of your material reaches you in car load lots, but you can commence your material handling even back of the car-load lot. An item I read the other day mentioned how one plant that used a large amount of bar steel had the steel shipped in bundles so that instead of handling a single bar at a time, a man on each end, the required number of bars, in bundles, were quickly delivered to their respective racks by means of a traveling hoist. It is a small operation to bundle those bars on the racks in the steel mill. It is only the work of a few seconds to knock the bundles loose after they are placed on the stock racks, but what a whale of a difference it makes whether two men lift a hundred bars of iron, one bar at a time, and hoist them out over the side of a car, or whether the hundred bars are handled by two men provided with suitable equipment for the handling job. And even though you had the two men provided with suitable machinery, unless you commence at the time your order is placed and specify how your material is to be delivered, you are getting no advantage in this case from your modern equipment. That is where that much used word 'planning' comes in.

"Now, once your material is in its proper place on the rack, then what? What means are provided to transfer the material from the racks to the first step in the process of manufacture? Crane trucks? Tractors? Industrial railway, or is it push trucks and man power? I saw a letter analysis of the steps of manufacture one day recently, and believe it or not men, the handling of the materials seems to have more consideration than the actual finishing operations did, and also it seems almost any mechanical contrivance under the sun was pressed into use as an aid to this means. In the automobile plant we have mono-rail systems overhead and the chain conveyor on the floor. In some factories flasks are rammed up at the molding machine and set on the rim of a turn table. As the table revolves it brings the flask to a point on the opposite side where the pouring ladle is ready to pour the mold. From here the flask is shaken out, and the flasks are routed back to where they will be used again. The molding sand is dumped into a conveyor and sent back to a sand mixer, while the castings drop into another conveyor and without further delay arrive at the cleaning department."

"Sure is a beautiful picture, Bill," answered Highball, "savoring of efficiency to the last degree, but not entirely applicable in our particular case."

"Not applicable at all if the shop layout chances to be at random and the transportation system patched on to fit."

"Admitting that to be the case," said Highball, "what is your recommendation for betterment?"

Trying a Fresh Start in the Shop

"It may be visionary and also it may be beyond reach, but at the same time it will do no harm to consider it. Why not plan the inauguration of a transportation system? Suppose, now, you take your floor space as you have it and lay out some definite transportation route. You have, of course, certain permanent objects or places which will not admit of alteration. Giving those consideration, lay out your transportation line, just as the railroad builder laid out his line in giving proper consideration to certain unalterable physical characteristics. Next suppose you consider moving your industries, which in this case are represented by your shop tools, to sites where they will be better served by your transportation line.

"And while we are about it, it might not be a bad idea to consider your transportation system as a separate shop department. In that case you would have all your transportation under one head. Your workmen and your gang foremen would look to one responsible party instead of having daily arguments with Tony, Joe, or Bill regarding whose duty it was to transfer certain materials."

"Are you considering that it would cost real money to rearrange the tools in the shop, Bill?"

"Yes, certainly; but if the tool is motor driven, so that it may operate as readily in one spot as another, isn't it reasonably certain that the transfer of material by hand from day to day to and from that tool will cost as much in a year as the single job of moving the tool to the work? Possibly when you check the cost of material movement against the cost of relocation, you might find many good and sufficient reasons to believe that the suggestion contains more than visionary talk. As Tom will agree, routing is one of the secrets of the high production in manufacturing establishments, today."

"That's true," said Tom.

"Admitting that this relocation idea is good, what means of transportation would you suggest after the relocation was completed?" asked Highball.

"Possibly it would be advisable first to consider a process of elimination. When railroads were young the wheelbarrow was one of the universal material-moving appliances. Evidently it was but a short step to the two-wheeled hand truck. The design of this truck avoided the necessity for lifting heavy objects from the floor to the truck itself. The small four-wheeled wagon in due course was brought into use to handle objects too large for the two-wheeled hand truck or the wheelbarrow. All three have their proper uses, yet they are noticeably scarce in well-regulated manufacturing establishments.

"The steam shovel, the drag line, the ditching machine, the ballast spreader, the standard-gage dump car, and the tractor have come to take the place of the wheelbarrow, horse-drawn scraper, or the dump wagon, but the old push truck still bumps along over many an uneven shop floor."

"Well, what have you to take its place?"

The Modern Mediums of Shop Transportation

"A few of the many things that are taking the place of the older forms of transportation in industrial systems, beginning with the raw material, are car dumpers, elevators, and trestles for handling car-load lots of bulky materials. A traveling hoist equipped with a lifting magnet for the big stuff outdoors can do a marvelous lot of work when properly led to its tasks; for example, jobs such as lifting bundle steel, which I mentioned a while ago, and numerous other tasks. Gantry cranes are used a lot in outdoor work. Inclines are too familiar for me to mention. It is a bet too good to be overlooked, too, that a set of roller conveyors, together with gravity, which you can utilize when unloading ma-

terial from cars, have the hand truck chased off the map."

"So much for outdoors, Bill, but you were talking about shop layouts."

"Yes, but in talking about shop layouts, I was trying to give you a picture of how material might be handled from start to finish. Inside, the facilities are even more numerous than for outside work. Shippers always prefer the shortest route between the points of origin and destination of a shipment. Let's move that lye vat, for example, from its present location on the branch to a point on the main line somewhere between the stripping job and the place where the repair work will be done. The fitting benches should also be convenient to the main line. Thus far, you have avoided a round trip to the lye vat and return, as well as the side trip to the fitting bench. Now, for example, if we would group certain tools within reach of a jib crane, which in turn reached the main line, we would be approaching closely to manufacturing plant conditions."

"Seeing that you have condemned my hand trucks as obsolete, what do you propose to give me to take their place, Bill, or possibly Tom has engineered some neat little plan to save the day," retorted Highball.

"Almost anything you choose to select," said Tom. "The most flexible of all is a tractor of some description with a supply of trailers. If you choose, you can have the tractor haul the trailers between points and go about other work while the trailers are being unloaded and loaded. Many plants where heavy castings are handled have tracks running through the shops to permit the use of small cars, similar to the railroad cars, which may be pushed or pulled by gasoline tractor. An electric truck carrying a lifting crane, which in turn is equipped with a magnet, makes almost the last word in flexibility and general use. Since you nowadays have comparatively few belts to contend with, you might even consider the use of a monorail system which carries trolleys equipped with hoists. A 200-ton traveling crane, while it is amply strong for the purpose, does not always provide the most economical way to handle smaller parts. If you were planning something new and had the money available, I could tell you where to secure a wall type traveling crane. The general appearance of this crane is similar to the jib crane, except that the wall crane is power driven and will travel the entire length of a shop bay.

"A respectable railroader would blush asking for the price of one of the new equipments you mention. Equipment costs money."

"No question," said Tom. "But if you were adding the handling cost to the items you put through your repair department, you would find that your shop freight bill would run noticeably beyond the 1.08 cents per ton per mile which I understand was the average cost in this country last year."

"Well, maybe so," said Highball. "But how do you like the little tote boxes we use for handling small parts where they run in quantities?"

"A big step in the right direction," said Bill. "They certainly beat the old familiar nail keg which, with its accident hazards, is entirely too conspicuous in many shops. Even there we have a big chance for improvement. Glance through some factory equipment catalogues and notice the tote boxes; some, equipped with rollers, may be pushed short distances in placing them suitably near machines. Then you have another kind provided with legs, which enable you to run a lift-platform truck under the loaded box and away it goes with no other effort than that of the truck operator and his mechanical aids."

"You know I have noticed," said Highball, "that the subject of material handling seems to have received a lot more attention in late years than it did years ago."

"Well, maybe in some lines," remarked Tom James. "But when you were a boy and went to the grist mill, you never saw the old miller carry a sack of grain upstairs to the top of the mill. Instead, he had an elevator, which was only a belt equipped with little metal pockets. He dumped the grain down into a hopper. The elevator carried it to the top of the mill where gravity forwarded it from one operation to the other. If there was a side movement, a screw conveyor, just like you use with your locomotive stokers, took care of the job."

"I've been in several shops," said Highball, "where all scrap was loaded in big boxes within reach of the traveling crane. Periodically a car was run into the shop, the boxes raised by a crane, and dumped into the car, and the scrap started to its destination with aid of very little man power."

"Well," said Bill, "you can see for yourself, Highball, the difference that handling even scrap material made in that particular instance. When the various operations in a repair shop were conducted as they were some twenty-five or thirty years ago, material handling didn't really mean so much. Still we have often watched a blacksmith or a machinist who, when working on an order of small parts that required a subsequent operation, would lay each piece down, just so, in order that he could pick it up for the next operation with the least possible effort on his part. We called that kind of a man a neat workman, but he was really, although unconsciously, an efficiency expert. The automatic machine tool and the forging machine have caused the amount of material handled by a single workman to increase five, ten, or even one hundred fold beyond what it was at that time. But the attention given the subject has not increased in the same proportion."

Highball Suggests Some Limitations

"There is a lot to be seen in the examination of the transportation industry 'from the inside' as Bill has remarked," said Highball. "I don't know, however, that it is entirely feasible to consider repair-shop arrangements in the same light as those of a place where new work only is being handled. You agree to that, Bill?"

"Certainly. There is a vast difference between the operation of a manufacturing plant and a repair shop. On the other hand, there is a certain routine and similarity to repair jobs. That line remains day in and day out, year in and year out. Your materials in the repair shop must travel approximately over the same route. The best route is the one to choose."

"One objection to the whole thing, Bill, is that the same machine may be required to perform work on several different units. For that reason, with due respect to the opinion of my guests, I would say that the same tool cannot well be operated in two or three different groupings at the same time."

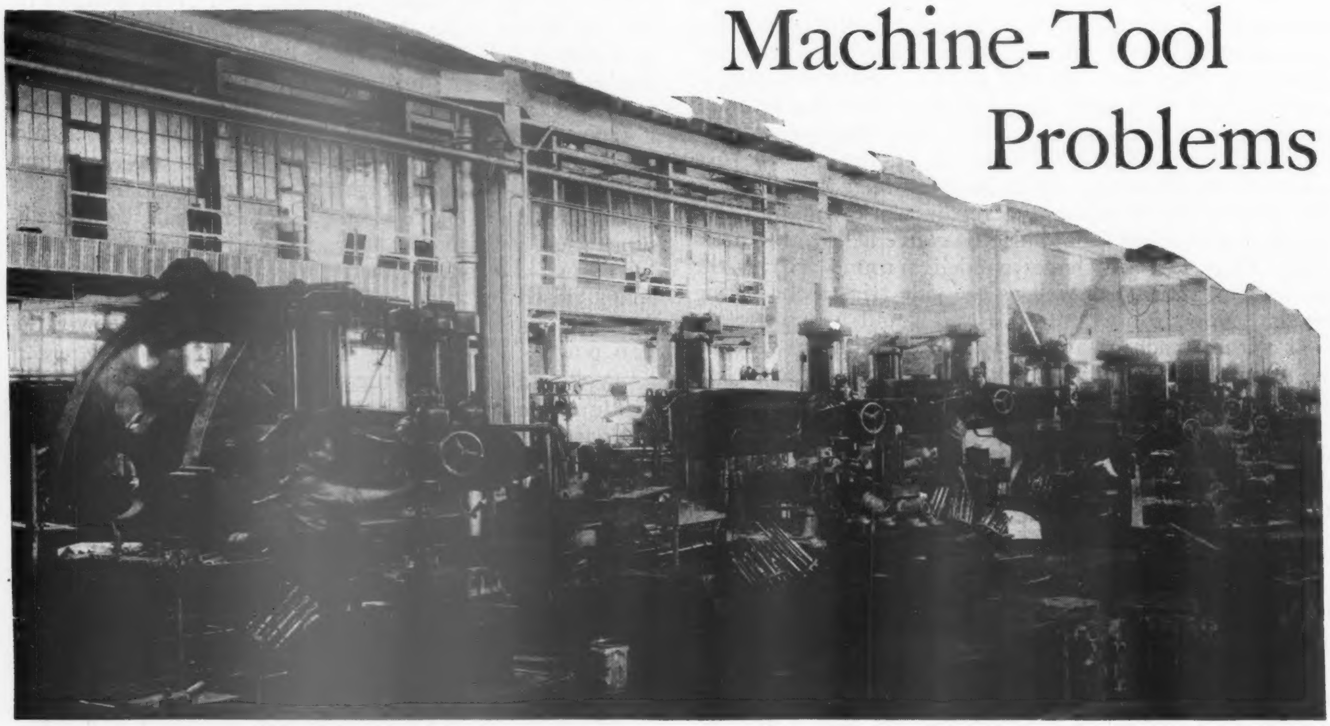
"Aren't those machines in most cases the smaller, general-purpose tools, Highball?" inquired Bill.

"Mostly. Yes."

"It is not practical in all cases to group machine tools so that they suit all the various jobs they may be called upon to perform, but wouldn't it be good sense to add a few small machines in places where their presence will save the expense of moving materials or where it will speed up the movement of a particular kind of material. Handling materials, Highball, is a mighty important subject."

"Handling materials! Why darn it, man, in one way or another, that's a railroad's whole business."

How the Builders Meet Their Machine-Tool Problems

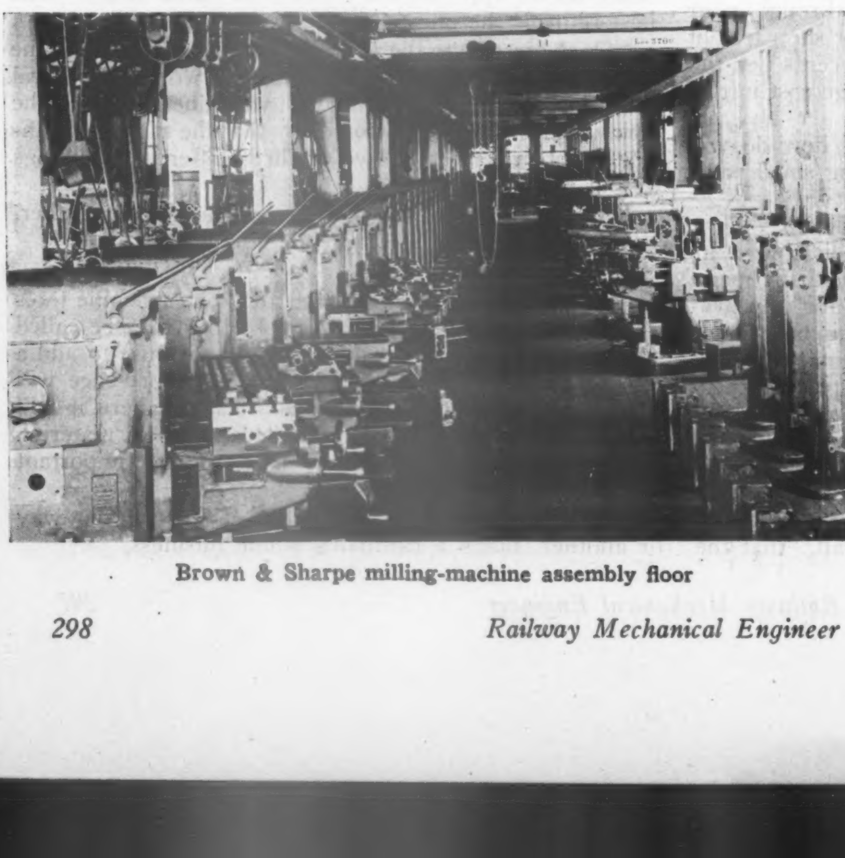


Radial drills in the Bullard plant—Latest models are replacing the "best previous" at a saving of about 30 percent

RAILROAD repair shops, irrespective of their size, may generally be considered as job shops. Because of the many different types of cars and locomotives operated by a railroad, it is difficult for the shop to find many pieces of exactly the same part so that the machines many be tooled for repetitive work. Some roads have established centralized repair shops where limited numbers of specialized machines are used to advantage.

The plants of most machine-tool builders operate under similar conditions. The products of the average machine-tool manufacturer include several types of machines which are made in many different sizes and combinations. For instance, one builder manufactures milling machines, grinding machines, automatic screw machines and thousands of different cutters and small tools. Thus, the plant of this particular builder cannot be organized as is an automotive plant in which batteries of a single type of machine are tooled for continuous, repetitive production of a single part. Similar conditions may also be found in plants in which only one general type of machine is manufactured. As an illustration, one company which manufactures milling machines has listed in its catalogue 75 different sizes, models and combinations made from two basic types of millers.

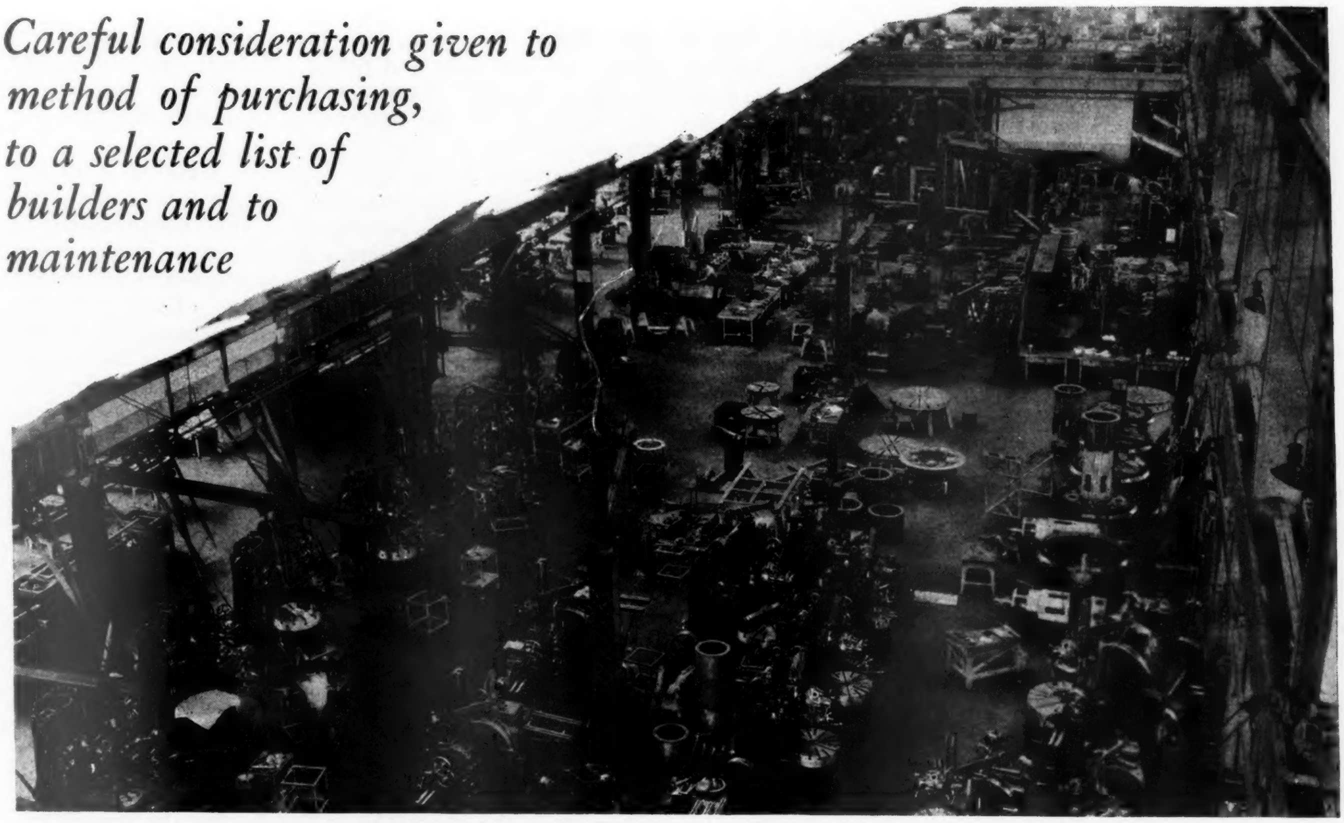
Since both the railroad repair shops and the machine-tool builders' plants operate under conditions which are so nearly parallel, it is reasonable to assume that the nature of the problems involved in the selection, purchase and maintenance of machine tools in both industries may also closely parallel each other. With this assumption in mind a survey has been made of the plants of five manufacturers of machine tools to determine how they handle the machine tool problems in their own plants. The plants visited were chosen with no advance knowledge of their methods of dealing with the problems under consideration. Judged by quality of product and volume of production, however, they are all highly successful manufacturers.



Brown & Sharpe milling-machine assembly floor

Two of the five manufacturers visited do not have a definitely organized system of selecting and purchasing machine tools. The remainder of the plants included in the survey

Careful consideration given to method of purchasing, to a selected list of builders and to maintenance



Vertical turret-lathe erecting floor in the Bullard plant

have developed highly organized methods by which their machine-tool problems are dealt with systematically and effectively. Volume of production, economy and obsolescence are the three most important factors that these builders consider in purchasing a new tool.

Changes of design in the builder's product often completely change the balance of machining operations, and production is slowed up either by insufficient or inefficient machine tools which are available for a particular operation. For instance, a change from a plain sleeve bearing to a ball bearing on a milling-machine spindle increased the extent of the boring operations on the head. This builder realized that little would be gained by providing more efficient machines to reduce production time at any other point in the shop until sufficient boring-mill capacity had been provided to eliminate the "bottleneck." The plant was operating 24 hours a day and the "bottleneck" was limiting both the the gross and the net revenue from the entire plant investment. In such cases steps are taken immediately to purchase the new machine tools needed to balance the rate of production of all of the parts of the finished machines.

Another manufacturer partially solves this problem by taking advantage of the fact that practically all of the tools in the plant are motor driven. If an exigency arises whereby one particular department consistently falls behind on its schedule, machines are moved from other departments that can spare them to help make production uniform throughout the plant. This is done only as a temporary move until the department is reorganized or new machines are purchased. This method of eliminating a "bottleneck" by the shifting of machine tools in the plant can be utilized economically and quickly only when the tools are motor driven.

The three builders who handle their machine-tool problems systematically are constantly looking for opportunities to replace old tools with new tools that will speed up production and reduce unit costs. As a general rule, a change will not be made unless a minimum of 25 per cent can be realized on the investment in the new tool.

Each of these builders has a machine-tool specialist

Grinding-machine assembly room in the Brown & Sharpe plant

whose duties are to study the different operations in the plant with the objective of finding out where a saving can be effected and what tools should be purchased to effect that saving. These specialists constantly keep in touch with the latest developments in machine tools by reading trade literature and trade publications, and by visiting the plants of other manufactures. The machine-tool specialist of one builder visits the plants of the manufacturers of the principal tools used in his plant at regular intervals for the purpose of becoming familiar with the latest improvements and also to learn of new manufacturing methods or of new machine tools that may be used in his own plant. He reports his findings to the vice-president in charge of shop operations.

If an old machine is replaced by a new one, it is not necessarily scrapped or sold as a second-hand tool. In each plant there is a certain amount of work which does not require great accuracy and which can be done on old tools. In all of the plants visited tools were found ranging anywhere from 15 to 30 years in service. These tools were giving a good account of themselves and, as was pointed out, would have been replaced long ago if the cost of a new tool could have been justified. In one plant a lathe over 35 years in service was operating eight hours a day on a job requiring a roughing cut on a certain part. This lathe had long been written off the books and the maintenance costs were also low. Much criticism has been directed against this machine by visitors going through the plant. The answer to such criticism has always been that, if a machine could be obtained that would do the work quicker, more economically and better, and would effect a saving of 25 per cent on the investment, it would be purchased immediately.

Form 190-2-29-1M

MACHINE TOOL CARD

KIND OF MACHINE .... MACHINE NO. ....

LOCATED IN DEPARTMENT NO. .... BUILDING SECT. ....

DATE PURCHASED .... SERIAL NUMBER ....

NAME OF MFGR. ....

ADDRESS OF MFGR. ....

SIZE OF MACHINE ....

DRIVE: BELT— DIRECT ☐ COUNTER SHAFT ☐ MOTOR ☐

ADDITIONAL EQUIPMENT ....

DISPOSED OF RECORD OF REPAIRS ON OTHER SIDE.

A machine-tool inventory record card

However, old machines in the builders' plants are not the general rule. On the whole, the ages of the majority of the tools average from eight to ten years. Of the machines removed from the builders' shops approximately 50 per cent are scrapped and the remainder sold as second-hand machines after they have been reconditioned.

How Requisitions for New Machines Originate

In addition to the work of the machine-tool specialists, the department foremen make recommendations for new machines. The method employed by one builder of originating a requisition for a new machine is typical. The department foreman, who is held responsible for output in his department, may find that a particular operation is always behind schedule because of certain machines that are not fast enough. In one plant the assistant works manager is the machine-tool specialist. This man and the foreman get together, study the operation and prepare data to determine conclusively whether or not a saving of at least 25 per cent can be made on the investment in a new machine for the plant.

The request for a new machine, together with the supporting data, is submitted to the works manager who, after approval, submits it to the vice-president in charge of shop operations. If the latter is convinced that a new machine is needed, the request is submitted for the final approval of the president. Because of the supporting data submitted with each request for a new tool, it is seldom that a request is refused by the higher officers of the company. It is interesting to note that this particular company within the past eight years has reduced its shop force from 1,400 to 800 men, primarily by the purchase of modern machine tools. Furthermore, the number of machines in the plant today is far smaller than it was eight years ago besides being more modern in design.

How Tools Are Purchased

After the builder has decided to buy a machine tool, the next problem is to select the manufacturer from whom it shall be purchased. The four primary factors generally considered by the builders are the quality and economy of the tool, the responsibility of the builder, and the delivery promised.

The builders buy only quality tools. The yardstick of quality is the character of the design, the provisions for lubrication, accessibility of parts and the ease of repairs and adjustment, the character of the materials and special features. Quality comes first and economy second. As one builder pointed out, a machine may give economy in unit production costs but, if the quality of the machine does not measure up to a high standard, it may be constantly down for repairs, which quickly wipes out any production economy that may be obtained with the machine. In other words, the builders have found out that it does not pay to purchase cheap tools.

Accordingly, for each type of tool the builders who handle their machine-tool problems systematically have prepared a selected list of manufacturers to whom bids are submitted. Thus, one builder submits bids for planers to two manufacturers; for lathes to four manufacturers; for drilling machines to three manufacturers, and so on. This system eliminates the broadcasting of bids to a large number of manufacturers, the majority of whom do not have a chance to get the business, but who may spend real money sending sales representatives to try to secure the order.

Problems of Maintenance

A word should be said about the term responsibility already referred to. It is essential that a machine-tool builder stand back of his product. The machine-tool builders demand of the manufacturers from whom they purchase their tools that they be able to give prompt service, furnish replacement parts promptly and, if a failure is chargeable to the machine and not to the user, that the builder make good. It was pointed out that the manufacturer of quality tools, for which a fair price is received, is expected to give good service, but that such service cannot always be expected from the manufacture of cheap tools because their margin of profit will not permit them to give such service.

After machine tools are installed, they must be properly maintained to obtain maximum service. The organization of the maintenance departments varies some-

what among the builders. It was found, however, that in four of the plants surveyed a complete record is kept of the history of each tool from the time it was purchased until it is scrapped. Such records are kept on machine-tool inventory record cards, two of which, obtained from different manufacturers, are illustrated. On these cards are noted the date purchased, the purchase price, the name of the builder and other pertinent information necessary for a complete record of a machine. In addition, columns are provided for keeping a complete record of the maintenance costs and the annual depreciation.

Depreciation

Speaking of depreciation, most of the builders depreciate their tools at the rate of seven per cent per annum. One builder has set 7½ per cent as the rate of depreciation when the plant is working one shift and 10 per cent when the plant is working 24 hours a day. None of the companies surveyed creates a reserve fund based on depreciation for the purchase of modern machine tools and shop equipment.

The information shown on the machine-tool inventory card is used in several ways. The actual investment value of each tool can be quickly determined by subtracting the accumulated depreciation from the original cost. The maintenance records disclose whether or not any tools are requiring an unusual amount of repairs. Memoranda attached to them also show which parts of a machine are giving the most trouble. One company makes it a practice to advise the builder of a machine that a certain part is inherently weak and is causing considerable trouble.

If the builder does not follow the suggestion to eliminate the trouble, this company will remove the manufacturer from its selected list. Such maintenance records have aided the builders in eliminating from their selected list those companies which build machine tools of poor quality.

How Maintenance Is Handled

One manufacturer, which employs about 500 men and has about 500 machine tools in its plant, has developed

MACHINE INVENTORY RECORD

MACHINE NO. NAME SIZE MAKER

DESCRIPTION

DATE PURCHASED	SHOP ORDER NO.	PURCHASE PRICE	RATE DEPRECIATION	YEARLY AMOUNT	UNIT YEAR

DATE	MAINTENANCE					DEPRECIATION	ACTUAL VALUE	LOCATION
	LABOR	MATERIAL	V. R.	YEAR TOTAL	TOTAL			

This card when filled out gives a complete history of the machine tool

a system of maintenance which is unusual in some respects. Under normal conditions each department foreman is held responsible for keeping his machines in repair. He has in his department a small special gang of men who make repairs and work on special attachments either for new machines or for machines already in service. When the plant is working at peak load a special gang is created which devotes all of its time to servicing the machines.

In most industrial plants during slack periods it is customary to lay off men because of the lack of work. This practice is avoided in the plant under discussion by keeping the men busy overhauling all of the machine tools so that they will be in as nearly perfect condition as possible when the next peak load develops. This system has been successful in keeping the organization together through slack periods and reduces interference with production schedules for machine repairs when the plant is operating to capacity.

In this plant the question often arises as to whether it is worth while to give a machine major repairs. If it is found that the machine is of value and can be used to advantage on other work, it is repaired. Furthermore, a certain number of machines are repaired and set aside to be used to help tide the plant over when it is abnormally busy. During the slack period these machines are used for odd jobs, particularly in connection with repair work.

Machine Tool Maintenance in a Plant Employing 6,000 Men

In another plant which employs about 6,000 men and uses about 3,700 machine tools the method of maintenance differs somewhat. The plant has a repair department headed by a foreman. Each department foreman must advise the repair foreman when a tool needs repairs. If the repair job requires less than ten man-hours' work, no estimate of the cost is required. If the repair job exceeds ten man-hours, an estimate must first be prepared and submitted to the machine-tool specialist of the plant who has in his office the record cards for all machines. If, for example, the proposed repairs amount to $500 he will refer to the inventory card for the machine and determine its book value. If the cost of repairs equals or exceeds the present value, the machine usually is scrapped, except in cases where old tools are set aside for special work. In the assembling and testing departments of most of the plants the machines in use have long been written off the books, but are well suited for the intermittent character of the work to which they are assigned.

Conclusion

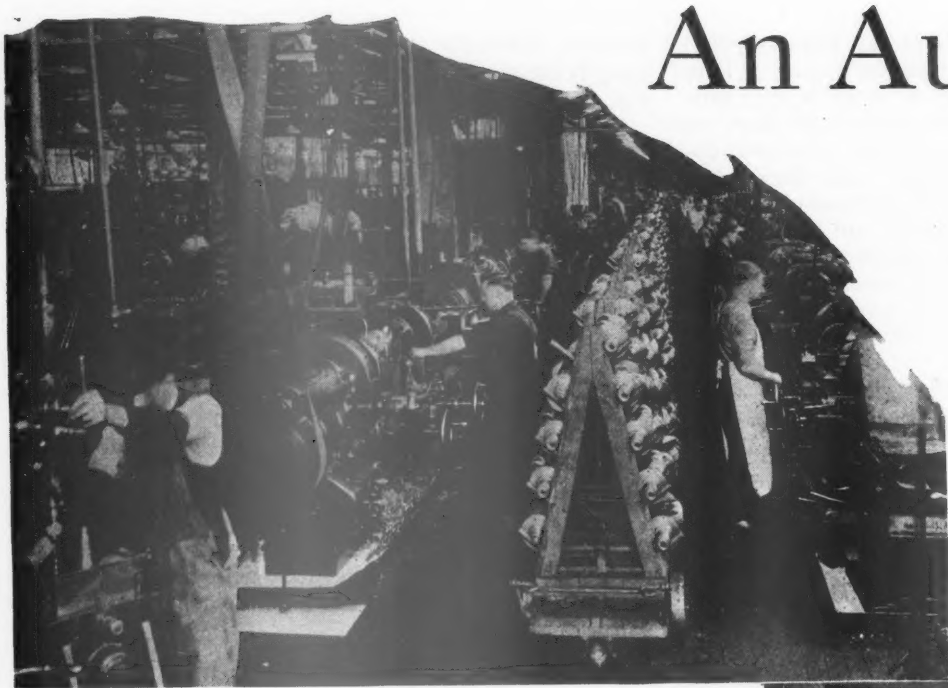
The results of the survey show that, fundamentally the machine-tool problems of the railroads and of the builders do not greatly differ. As a general proposition both industries base their machine-tool purchases on quality and economy. Both use practically the same types of tools and both are justified in using some tools of old vintage on special jobs, particularly on intermittent work.

Perhaps the practice of those machine-tool builders who have systematized the handling of their machine-tool problems most suggestive for adaptation in the handling of similar problems in the railroad shop is the establishment of a definite objective which must be obtained by the replacement of an old machine tool with a new one. In the case of the three machine-tool builders referred to in this article this objective is a return on the investment of not less than 25 per cent. Whether or not an objective as high as this should be set for the railroad shop must be determined in each case by the possibilities for profitable investment of capital in other facilities and must also be modified by the necessities of the shop, some of which, because of the difficulty of measuring the value of the output of the shop in dollars and cents, it may be impossible to appraise in this way.

An Automobile I

By

Howard Jones *



NOT long ago I had occasion to visit a large railroad shop with the chief tool designer of the company with which I am connected. This visit was prompted not so much by the desire to inspect some specific method of performing work as it was by a habit which every automobile plant engineer has of visiting other plants (not always automobile plants) with the knowledge that he rarely fails to return with some ideas that will be of invaluable assistance to him in performing his every-day tasks.

My early experience was gained in a railroad shop and it may be a coincidence that the tool designer who accompanied me on the visit had also served his apprenticeship and worked for several years in a large railroad shop before he came over to the automobile industry. It was, therefore, with a feeling of common understanding that we spent a whole day in discussing the problems and methods of the railroad shop with the superintendent in charge of the shop.

Some of the most successful automobile plant production men in the industry laid the foundation of their success in the development of production methods by years of training in railroad shops which were in existence in a more or less advanced state when the automobile plant was still in the same category as the country blacksmith shop.

I have been away from intimate dailv contact with the railroad shop for fifteen years and, as a consequence, my visit to the shop in question resolved itself sub-consciously into a period of comparison of methods in use fifteen years ago with those in use today. Fifteen years' experience in automobile plants has necessarily changed my point of view but as I observed the methods and the facilities used to handle the repair work on a modern locomotive I could not help but wonder just how far the automobile plant man would get in an attempt "to eliminate the antiquated methods and put the shop on a production basis" were he turned loose in a locomotive shop and told to "go to work." There is no doubt that his automotive shop experience would enable him to discover the short cut to the solution of many problems but it would not take him very long to find out that the great majority of railroad shop problems are of such a nature that no solution to them can be found in a large-scale, quantity-production manufacturing plant. The problems are entirely different and that fact must be recognized before any criticism of railroad-shop methods or suggestions for improvino them should be made.

What Is a True Comparison?

If any real comparison is to be made between the transportation industry and the automobile industry, as many critics of the railroad shop have been inclined to do, that comparison should be made between truly relative departments in the two industries. The locomotive builder and the car builder produce the implements of railroad transportation; the automobile manufacturer produces the implements of highway transportation. Here is the first real comparison between the industries—in which the railroad shop is not yet involved.

The railroad takes the equipment which the locomo-

* Mr. Jones is shop engineer for a large mid-western automobile plant.

Plant Engineer Looks at the Railroad Shop

tive and the car builder has furnished it and proceeds to produce its product—transportation—on a basis of efficiency which is never questioned by anyone who has ever had occasion to ship a ton of freight from the lakes to the sea in less than 24 hours or ride the "Twentieth Century" or the "Broadway" on its 20-hour run. The automotive industry sells its product to the motor-coach and truck operators who proceed to produce their product—highway transportation—on a basis of efficiency which is rarely questioned by those who have been able to open new fields by the use of this modern form of transportation in territories where the railroad never operated nor could operate with profit.

The railroad shop is the plant facility which has been built up by the railroad operator to overhaul the equipment used in his business; the problems of that shop are not directly related to the problems of the manufacturer of equipment. That the railroad has not endeavored to pattern the shop facilities and methods after those used in the production of equipment on a quantity basis is no reason why the railroad shop should be the object of misdirected criticism.

The highway transportation operator has developed an organization and facilities for the repair of motor coaches and trucks. Has the motor-coach or truck operator equipped his overhaul shop with the same kind of specialized tools and methods as are found in automobile production plants? That question is easily answered even by the layman who may have had occasion to deal with a private automobile repair shop. The answer is, unquestionably, "No." And what is the reason? Simply, that the problems of the manufacturing plant and of the repair shop involve entirely different factors: In one case maximum man-hour output of identical parts at a predetermined rate; in the other case maximum man-hour output on a variety of classes of parts at a varying rate determined entirely by an unknown demand.

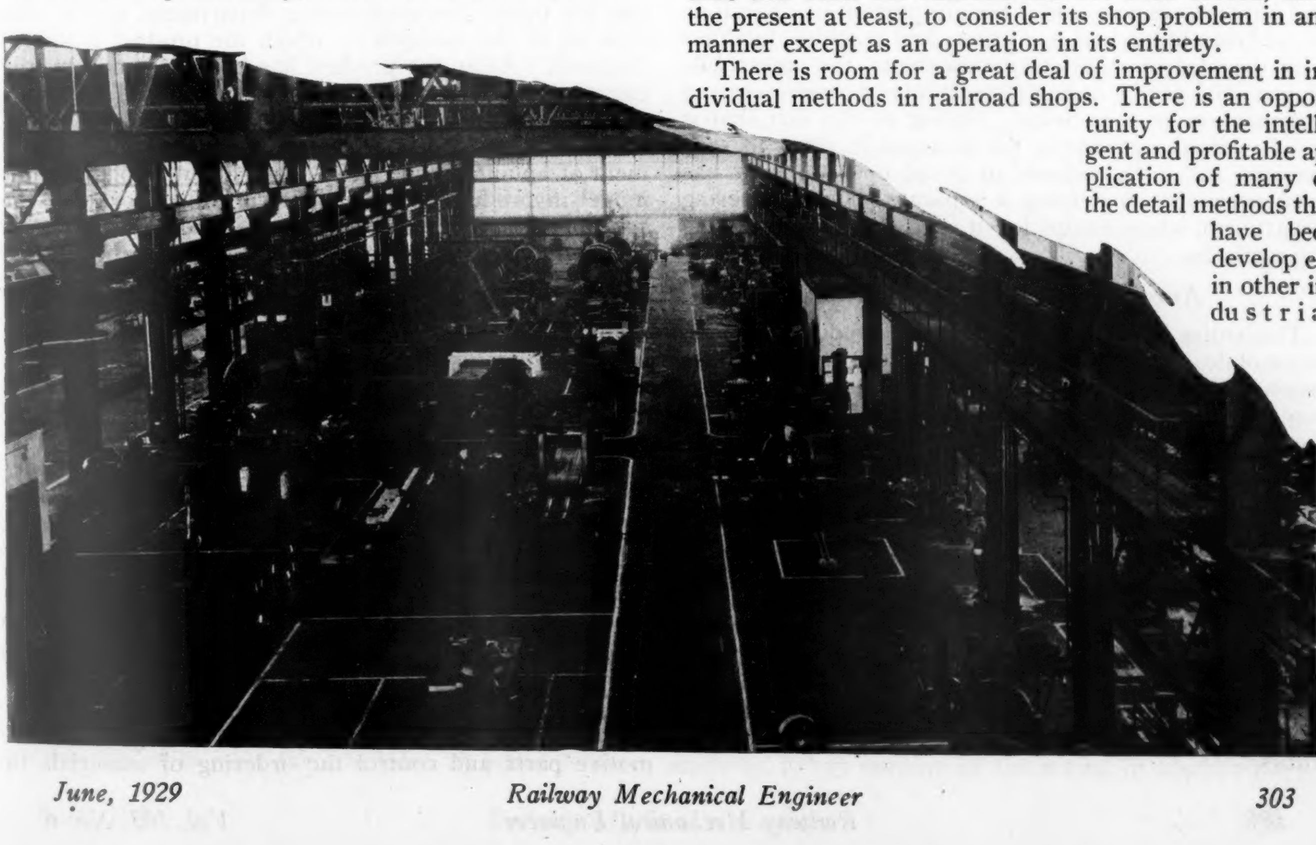
The Real Problem

To assume that the general scheme of operating a modern railroad shop could be radically changed in any manner that would immediately result in marked improvement in the cost of repairing locomotives would be ridiculous. To attempt to prove that there is anything generally "antiquated" about the facilities or methods that have been built up as a result of a hundred years of transportation experience would be just as unreasonable as to attempt to prove that there is something radically wrong with the methods and facilities that have been developed in the automotive industry as a result of 30 years of manufacturing experience.

The only difference is that keen competition between manufacturers in the automotive industry has forced the rapid refinement of facilities and processes, while lack of competition, as well as several other important factors, has permitted the railroad shop to continue in service many facilities and methods which could be discarded with resultant economies in shop operation.

Where the automotive plant has been forced to study individual operations in detail in an endeavor to cut time and costs the railroad has not been forced, until the present at least, to consider its shop problem in any manner except as an operation in its entirety.

There is room for a great deal of improvement in individual methods in railroad shops. There is an opportunity for the intelligent and profitable application of many of the detail methods that have been developed in other industrial



plants to the problems of the railroad shop. The weak link in the chain seems to be the fact that the railroads have failed to develop the same kind of trained men to study these methods that are to be found in the plant engineering divisions of many large manufacturing plants. Just how far it is advisable to develop such an organization or department in a railroad shop is a question that should be decided only after a careful analysis of the benefits which it is expected may be derived.

Finding the Opportunities for Savings

As the problem appears to one who is on the outside it seems that the first and most important question to be answered by the railroad mechanical superintendent in relation to the improvement of shop operating methods is: "In just what respect could the greatest amount of money be saved in the repairing of locomotives and just what steps could be taken immediately to effect tangible savings?"

If a railroad mechanical man (or anyone else) has an idea that some ingenious system could be developed overnight which would effect a spectacular reduction in the cost of maintaining locomotives per locomotive mile, he is probably doomed to disappointment. There is no reason to believe that the men at the head of railroad mechanical departments are any less capable in their own line of business than the mechanical men in charge of other industrial plants and it is unreasonable to suppose that, having lived with their problems day by day over a period of years, they would not have developed such a system before this if it were possible.

There are opportunities for improvement in detailed methods in railroad shops that will result in small but tangible economies in repair costs and over a period the cumulative savings will be surprisingly large.

In order to effect changes in detail shop methods, it is unreasonable to expect that any great amount of progress can be made by placing the responsibility for making intelligent changes in methods on shop supervisory forces who probably have about all they can do to keep up with the job of turning locomotives out of the shop. If an automobile plant had to rely on its shop foremen and supervisors to spend a certain portion of their time in studying individual operations and machine facilities with the idea of making improvements, the automobile plant would not be quite as spectacular a manufacturing organization as it is today. Owing to the fact that it is of vital importance in the automobile plant to save minutes and even seconds in detail operations, it has been necessary to develop a separate shop-engineering department whose entire job it is to study manufacturing methods.

Automobile Plant Organization

The entire problem of design and production in an automobile plant is controlled by the engineering division which employs a corps of engineers for the purpose of developing, improving and standardizing parts used in the assembly of automobiles or trucks. Under the supervision of the engineering division is an experimental department where all new or improved parts are made. In this department a part or a unit is built and thoroughly tested before the final and complete drawings are released to the factory for production. Standards must be adopted which can be and are controlled by the engineering division. By the maintenance of complete unity of purpose between the engineering, factory and service departments, it is comparatively easy to maintain standards which simplify the problem of manufacturing or servicing automobiles and trucks.

In a comparative sense, the mechanical-engineering department of many railroads, insofar as new or improved parts are concerned, seems to have relatively little control over locomotive parts, except possibly to make recommendations or criticisms as a purchaser, inasmuch as the product which the railroad shop repairs is purchased complete.

Any discussion relating to the simplification of locomotive repair work as a whole must necessarily lead eventually to a discussion of standardization. Considering quantity of parts, the machine tool equipment available and the cost of revising these tools, the problem of standardizing locomotive parts seems to rest largely with the railroad itself and can be worked out only to a very limited degree which must be governed by a consideration of whether the cost of standardization is greater than the cost of repairing individual parts. Where standardization seems to involve greater cost, the logical thing to do is to pay the price of repairing non-standard parts.

It used to be the practice in railroad shops, and possibly is to a certain extent today, to tear down a locomotive as it passed through the shop for repairs and repair the individual parts with very little respect to the dimensions to which the parts were originally built. Therefore, it would seem that one of the most important steps that could be taken to effect an improvement in locomotive repair work would be to control the repair of locomotive parts from a central engineering department in such a manner that an overhauled or rebuilt locomotive would be turned out of the shop with parts which are built to the same dimensions as the parts with which the locomotive was originally built. This practice would at least promote the possibility of interchangeability of parts and would make possible the elimination of delays in many cases by the ability to furnish parts which could be manufactured and carried in stock. The extent to which this practice might be developed would, of course, have a direct relation to the number of locomotives of similar design which might be in service on any one railroad.

In the automobile plant the next step carries the work into the production engineering department, which controls all of the methods by which the product is manufactured. After the product has been designed by the engineering division, the drawings are turned over to a group of engineers who study the problem of parts standardization. The production-engineering department of an automobile plant, when about to place a new model in production, must first carefully work out the schedules in such a manner that the whole job of manufacturing may be given to the shop with the certain knowledge that the requirements of the manufacturing schedules do not exceed the manufacturing capacity of the plant.

The production-engineering department must design all of the tooling equipment required to produce the job and after this has been done the drawings and specifications are next turned over to the planning department which makes up the manufacturing schedules. This department, from these schedules, orders all of the material to be used in the manufacture of the product. These schedules show the exact number of units to be built over a certain period of time.

This brings us to another conclusion that may be drawn from an analysis of automotive shop methods that may profitably apply to a railroad shop—the possibility of elaborating the function of the railroad mechanical-engineering department to a point where it may intelligently control the design of new or improved locomotive parts and control the ordering of materials in

such a manner that the investment in parts or materials will not exceed the benefit to be derived from having these parts or materials on hand in sufficient quantity to eliminate delays to the repair program.

Apparently the degree of co-ordination of effort between the mechanical-engineering department and the shops on many railroads, even today, is not such as to bring about the most effective control of either the design of locomotive parts or the repair or improvement of these parts as a result of experience in service. If this be true, isn't it possibly because the members of the shop organization and of the mechanical-engineering organization are neither fully appreciative of the problems with which the other has to contend? Were it not for the fact that the production-engineering department of an automobile plant is close to the work of the engineering division and at the same time close to the manufacturing end of the business, there is no doubt but that the engineering division would often design a product which it would be next to impossible to produce at a reasonable cost in the shop. The production engineering department, then, is in reality a go-between, taking the ideas of the designers and developing practical methods to turn these ideas into a product which can be produced at a profit to the company.

If this form of organization is successful in the automobile plant, why would it not be just as practicable an idea to develop a shop-engineering organization on a railroad, the duties of which would be to study new designs of parts turned out by the mechanical engineer or improvements in the design of parts on existing equipment and develop methods to produce or repair these parts at a profit. Obviously such a shop-engineering department on a railroad would not need to be organized on anywhere nearly as elaborate a scale as it is in the automobile plant. Neither is it to be expected that the personnel of such a shop-engineering department could be recruited from other fields than the railroad field. If the idea of a shop-engineering department on a railroad is sound, it seems reasonable to suppose that one of the important problems of the railroads is to establish some agency which will assure the introduction of men in the railroad organization who can be thoroughly trained in railroad shop problems and trained at the same time in modern engineering methods.

The Work of the Shop Engineer

Assuming that the railroad has developed the shop-engineering department, let us consider some of the functions of that department. One of the first things to be done would be to study in detail the possibilities of improving the design of parts with a view to simplifying the manufacture or repair of those parts. This could only be done by conducting accurate and intelligent investigations of the performance of parts in service and controlling the design of such parts in a manner that any changes in design would not involve costly alterations in manufacturing or repair methods unless entirely justified by service results.

The next job of the shop engineer would be to develop a shop-scheduling system that would be something more than a mirror which reflects past performance. The shop-scheduling system of an automobile plant is designed to obviate the possibility of delays in the production processes. One or two of the railroad shop scheduling systems that it has been my privilege to observe seem to be designed to provide a rather elaborate collection of alibis for the different departments as to why they failed to meet the schedule. A schedule system, worked out by men trained to analyze shop operations, will not only speed up the operation of the shop but it will also provide a most accurate indicator of the departments or operations in the shop that are most in need of revision or improvement.

If, in this article, the writer made an attempt to outline in detail the course that should be followed in improving the methods in railroad shops the reader would probably reach an early conclusion (and justly so) that "here is another one of those automobile plant fellows who thinks he knows more about running a railroad shop than a railroad man does," so I am going to bring this discussion to a close by outlining the course I would endeavor to follow if ever I should find myself back in the railroad game with the opportunity to add to my railroad experience of 15 years ago the experience I have since gained in an automobile plant.

First—Study the advisability of establishing a shop-engineering department of men trained in railroad shop work and modern engineering methods.

Second—Give these men the opportunity of studying in detail the methods used in other industrial plants and particularly the private overhaul shops of large fleet operators of motor-coaches and trucks.

Third—Analyze the type and condition of every machine tool in the plant in an effort to determine whether or not many of them might not profitably be replaced.

Fourth—Study the tooling equipment of individual machines in order to determine whether or not the maximum productive capacity of the machine tool is being utilized.

Fifth—Compile accurate cost figures as to the real cost of home-made tools and equipment to determine whether or not it might not be more profitable to purchase such tools or machines from reputable manufacturers and thereby release many men in the shop for the more important work of repairing locomotives.

Sixth—Impose upon the shop engineer the responsibility of developing a shop-schedule system that will point out sources of possible delay far in advance and then give the shop engineer the authority to make such changes in methods or equipment as will remove the cause of those delays.

Seventh—Impose upon the shop engineer the responsibility of selecting shop equipment; make him absolutely responsible for its success or failure in service. If the head of the mechanical department has confidence in the ability of the man who holds the job of shop engineer to select equipment that will perform satisfactory work at minimum cost, back him up when his judgment is questioned by other departments which may have other than engineering motives for questioning his selection. But if he selects equipment that does not stand up in service or does not produce the desired results or savings, fire him and get a better man for the position.

Eighth—Study the important problem of material handling. The time that is lost by unnecessary handling and by the use of inadequate equipment or manual labor is appalling. A little intelligent study of this problem will always disclose the possibility of making changes in operations or equipment that will save many thousands of dollars.

Ninth—Maintain a simple but complete record of all of the machine tools in the plant. An inadequate or obsolete machine is like an old horse. It costs more to keep it than it's worth. When a machine has reached the end of its economic service life, scrap it without hesitation and replace it with a modern machine. The increased productive value will usually pay for the new machine, to say nothing of the saving in operating and

maintenance costs or even the improved morale of the operator who has to run it.

Conclusion

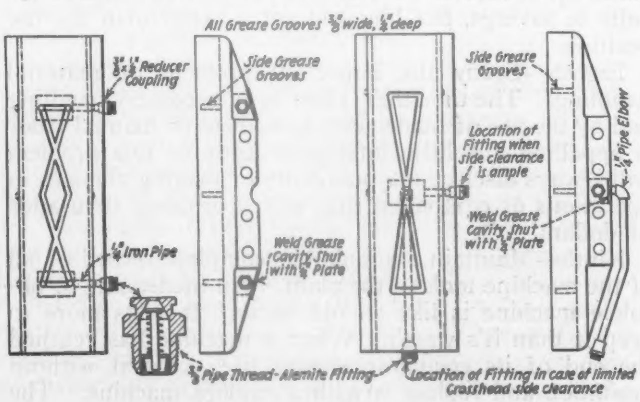
Improvement in shop operation can only be brought about by a careful study of shop conditions by trained men who devote their entire time to the job. There is a real opportunity for the right kind of men to study the problem of the railroad shop and I sometimes wonder if it is not a lack of individual initiative which prevents more rapid progress being made. In the automobile plant it is a problem of the "survival of the fittest" and the unfit do not remain very long on the payroll. I know from personal contact with railroad men that many of them feel that the men in the automotive field occupy a far more desirable place in the scheme of things than do the men in the railroad shop simply because certain outstanding positions pay large salaries. They probably do not consider the high mortality rate and the fact that the high salaries are paid only to men who are capable of accomplishing the seemingly impossible in the face of the greatest obstacles.

Possibly what the railroad man needs is a greater appreciation of the real possibilities of his job. The automotive man is never permitted to assume that a thing can't be done because it never has been done before—he is told to go and do it. Precedent seems to play a large part in the attitude of many railroad men and I am, therefore, not surprised to find some of the practices that were in effect fifteen years ago still looked upon as the best way to do things by some men to whom it has never occurred that they might be improved.

Economic necessity is forcing many rapid changes in industry. It is undoubtedly possible that the railroad industry is entering upon a new era wherein it will take advantage of all that is adaptable and worth-while in modern industrial methods. If this be true, then the railroad-shop man has every right to look into the future with a confidence that a new order of things will create the opportunities that he may feel now exist only for those in other fields.

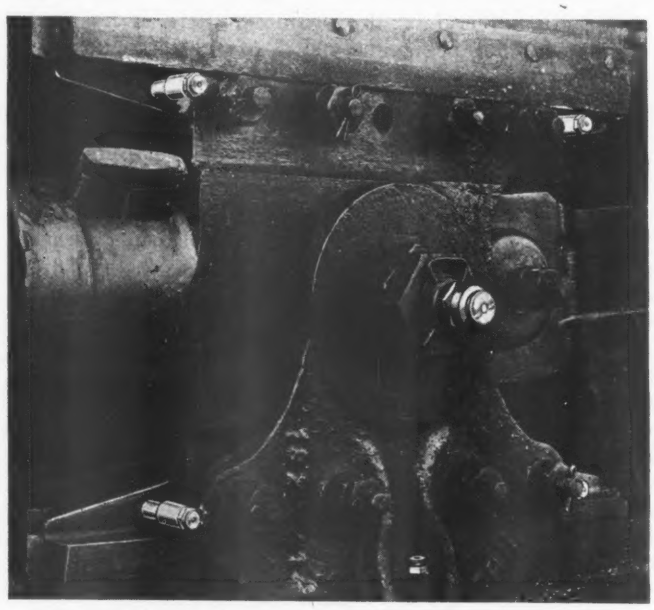
Grease Lubrication of Crosshead Shoes

TESTS are now being conducted, notably in switching service on the Peoria & Pekin Union and in fast freight service on the Chicago & North Western with a new method of lubricating locomotive crosshead shoes by means of soft grease applied with a pressure gun through suitable fittings to grease cavities and grooves provided in the shoes. The grease used is a special soft grease furnished by the Texas Oil Company, and the fittings are standard Alemite fittings made by the Alemite Corporation, Chicago.



Details of Alemite applications for crosshead shoes

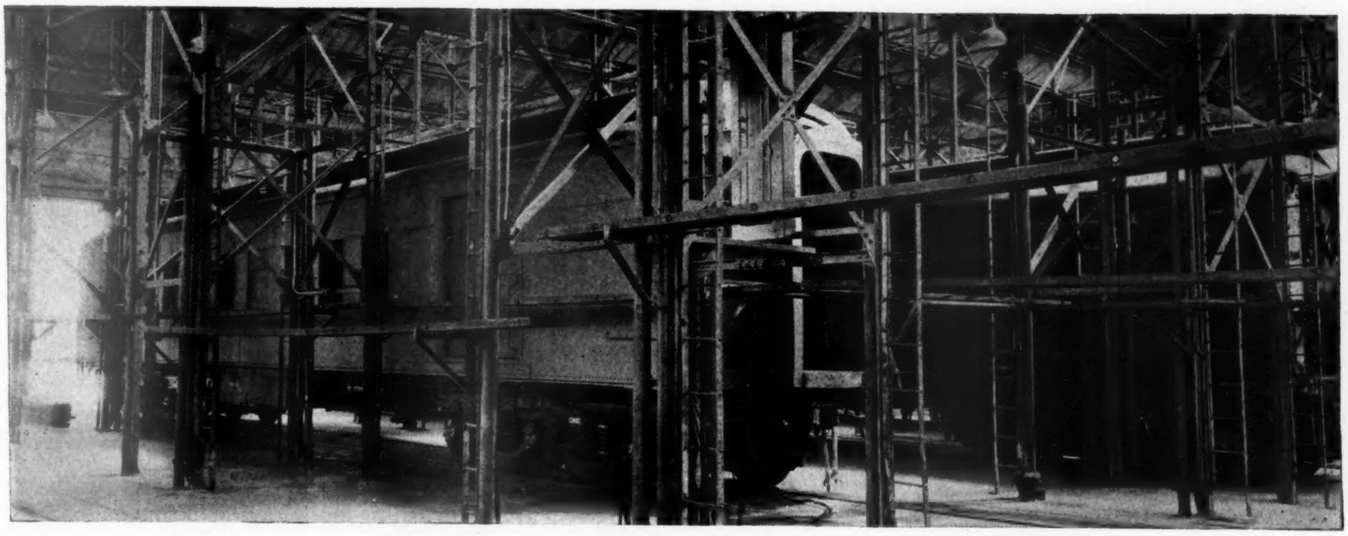
Referring to the drawing, the details of application of this method of lubrication to two types of crosshead shoes are illustrated. The grease cavities are machined in the shoes, as indicated, being closed by 1/4-in. plates welded in place and tapped for insertion of the pipe nipples and pressure gun fittings. Grease grooves, cut on the faces of the crosshead shoes, are connected with the grease cavities by one or more small holes as may be required. When the cavities and grooves are filled with grease, movement of the crosshead with respect to the guide establishes a film of lubricant between the bearing surfaces, and further movement creates a partial vacuum which draws additional grease out of the cavities into the grooves. This vacuum and consequent drawing action is intermittent, lasting on each crosshead shoe only as long as it is in contact with the guide under pressure, as determined by the crank pin position.



Crosshead equipped for complete pressure lubrication

Quite extensive tests of this method of lubricating crosshead shoes on switching locomotives of the Peoria & Pekin Union are said to demonstrate its advantages from the point of view of providing adequate, positive lubrication, but without waste, as well as saving time. The cavities are quickly and easily filled with grease from a grease gun before the locomotive leaves the enginehouse and no subsequent attention on the part of the engineman is ordinarily required. One filling, once in 10 days, is sufficient.

This type of crosshead lubrication has also been tested for a number of months on the Chicago & North Western which has two locomotives in time-freight service between Chicago and North Fond du Lac equipped. The crosshead grease cavities are filled on these locomotives on every round trip, or after a distance of 303 miles. Operation of the locomotives during the severe weather encountered last winter showed that good lubrication is consistently maintained and that the grease is not wiped off the guides by the action of the snow, or its lubricating qualities impaired due to the low temperatures.



An open type passenger-car paint shop

Modern Finishes—The Problems of Application

An analysis of the hazards introduced in railroad shops by spraying car and locomotive finishing materials

IN the short period since 1923 the development of paint spraying-equipment and the introduction of quick-drying lacquer finishes has focused attention on the practical possibilities of the application of finishes by spraying to such an extent that, except for touching-up and lettering operations, the use of the brush for applying finishing materials to locomotives and cars is fast becoming obsolete in modern railroad shops.

The introduction of quick-drying lacquer finishes probably did more than any other one thing to emphasize the potentialities of the use of the spraying method of finishing in equipment painting. As a result of this, the master painters on many railroads, while not yet convinced of the practicability or the economy of adopting lacquer as a car and locomotive finish, nevertheless have accepted, the spray method of applying paint, enamel and varnish. With the acceptance of this more modern method of finishing two elements were introduced with which railroad men found it necessary to contend; namely, the fire hazard and the effect on the health of the workmen. There has been a tendency on the part of railroad men to over-emphasize these hazards and this tendency has been due in part to the fact that many of them have not had at their command sufficient facts concerning this new method to enable them to arrive at accurate conclusions. This article is written with the hope that by assembling certain related facts for consideration many of the erroneous

A Paint Shop Equipped with a Canopy-Type Exhaust System

opinions concerning the spray method of applying paints, varnishes and lacquers may be corrected.

In an article published in the May, 1929 issue of "The Travelers' Standard" a publication of the Travelers' Insurance Company, dealing with the fire and health hazards of the spray-coating process, the problem in its general aspect and the solution to it are so well stated that the following quotation is included:

"The spray method facilitates the release into the atmosphere of the workplace, of vapors and particles from any inflamable or poisonous substances that may be present in the coating material. For this reason, if the proper precautions are not taken, the hazard of fires and explosions, and the possibility of ill effects on the health of the workmen, are greater in connection with the spray process than with dipping and hand-brush methods.

"The hazards created by the vapors referred to are attributable, in a large measure, to the inherent properties of certain ingredients used in the thinners. The vapors given off by most thinners or solvents of coating materials, may form explosive mixtures with air when present in even such small quantities as 4 per cent (or less), by volume. Moreover, it has been definitely determined that the vapors from some of the ingredients of the thinners are capable of producing severe physical distress (and perhaps chronic or fatal illnesses) when present in rather low concentrations.

"The base employed in the coating material may accentuate either one or other of the hazards mentioned above. For example, if a lead-base paint or silica enamel is sprayed, the additional health hazards of lead poisoning and silicosis, respectively, are created; and when pyroxylin lacquers are sprayed, it is necessary to consider the possibility of an accumulation of dry pyroxylin residue, much of it in the form of dust, in the vicinity of the spraying operations. Dry pyroxylin dust not only presents a serious flash-fire hazard, but also, when suspended in the air in suitable proportions, may explode violently, if ignited.

"Moreover, the 'setting' or drying of varnishes and other resinous finishes is accompanied by the oxidation of some of their constituents, and an appreciable amount of heat is evolved during this oxidation. Where varnish or other resinous residues are allowed to collect, this heat of oxidation, under favorable conditions, may easily be great enough to cause spontaneous ignition of the residues.

"However, means and methods have been devised for handling and applying the coating materials, which, if adopted and intelligently and conscientiously used, will greatly reduce the likelihood of realizing any of these harmful results. In other words, the dangers involved in the spray process are not due to the inherent hazards necessarily associated with the coating materials or their compounds (although these should be fully recognized), so much as they are to the use of improper methods in applying them."

The Effect on the Health of Workmen

The detrimental effects of certain ingredients used in painting materials which have been used for the finishing of railway equipment are so well known to those who have been associated with this phase of maintenance work for many years that there is no need to go into an extended discussion of the effect of ingredients so far as paints, enamels and varnishes are concerned. It may be well, however, to call attention to the fact that the spray method of finishing increases the possibility of the detrimental effects of certain substances that may be present in the coating material if necessary precautions are not taken to guard workmen against the inhalation of these substances while suspended in vapors in the atmosphere.

Because the spray method of finishing has, in recent years, been looked upon as a development coincident with the introduction of pyroxylin lacquers a number of investigations have been made by medical and health authorities in an effort to determine the effects on human beings of the inhalation of certain lacquer solvents. The report of one of these investigations, which was published in the October, 1928, issue of "The Journal of Industrial Hygiene," summarizes a rather comprehensive series of tests of the effects of lacquer solvents on animals as follows:

"As the result of the series of tests here reported the authors would divide the solvents tested into three groups:

"1 Those usable with safety concentrations usually employed or possibly in somewhat higher concentrations as ingredients of brushing or spraying lacquers. Ethyl acetate and amyl acetate, and possibly butyl acetate, would be placed in this class.

"2 Those usable with safety in present concentrations but to be increased with caution as possibly harmful if increased materially. Here would be listed gasoline, turpentine, and xylol.

"3 Those for which the present practice probably represents nearly the upper limit of safety in use as spraying-lacquer constituents: In this group are toluol and butyl alcohol.

"Provided reasonable exhaust ventilation is assured, however, all these limits may be appreciably raised with impunity.

"The entire investigation furnishes a strong argument for the insistence on exhaust ventilation wherever lacquers of any type are being sprayed.

"The materials listed and tested here do not nearly exhaust the list of those used as lacquer materials and the fact that practice in this respect is still frequently changing and new ingredients continually being introduced, about which there is available no information as to their effect on the health, is another argument for the protection of the sprayer in all cases. The removal of benzol from lacquers will undoubtedly remove the greatest single hazard from either acute or chronic poisoning in lacquer work but it does not warrant the discarding of precautionary measures."

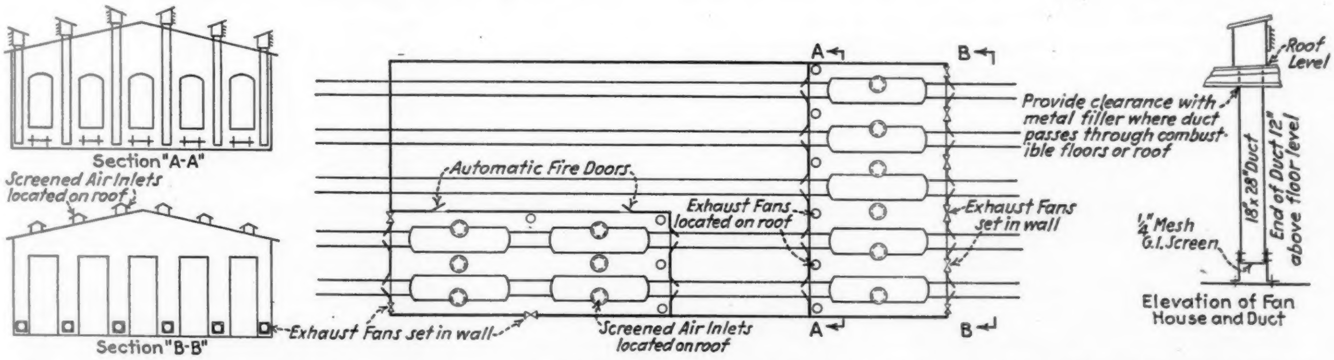
To sum up the question as to the hazards involved to the health of workmen it would seem that (1) lacquer in which benzol is used as an ingredient of the solvent offers a serious hazard to health unless precautions are taken to prevent the operator from breathing any of the lacquer vapor. Medical authorities explain that benzol attacks both the red and white blood cells, leading to anæmia and eventually, death. When taken into the system in small but repeated quantities, its effect is cumulative, somewhat as is in the case of lead poisoning. (2) The only safe protection for the operator in using lacquer containing benzol is a respirator or face mask through which air for breathing is supplied by means of a hose connection. A porous mask, through which the air passes directly, picks up and holds particles of the lacquer and so in effect tends to concentrate the amount of vapor breathed in by the wearer of the mask. (3) Lacquers in which benzol is not used as a part of the solvent are not dangerous to the health of the operator providing the concentration of vapor in the air is not allowed to increase above the amount which should not be exceeded under the precautions taken for fire prevention. The better grades

of lacquer in use today do not contain benzol. There are, however, lacquers on the market which do contain benzol and it is of importance to recognize this fact in the selection of this class of finishing materials in order that proper protective methods may be employed where these are to be used.

Eliminating the Fire Hazard

The fire hazard in connection with the spray method of finishing is rather a result of the method of application than of the nature of the material applied. Oil paints and varnishes are inflammable and, when applied by spraying, tend to fill the air with a mist of inflammable material. If this mist accumulates in the right proportion, the mixture of air and mist will ignite from a spark. The proportions of the inflammable mixtures vary with the materials. This hazard is readily guarded against by adequate ventilation, so applied as to keep the concentration of vapor and, in the case of lacquer, the pyroxylin dust left by the evaporation of the solvent below the point at which a flash fire can occur. This is the fundamental requirement for safety. There are other features involved, such as good housekeeping and protection against sparks from any source in an enclosed area immediately surrounding the application of the equipment. As the method has been extended in application to the greater portion of the equipment on many roads, and as the demand for a more rapid finishing process has become acute as a result of a demand for the more intensive utilization of equipment, it is becoming increasingly necessary to consider proper ventilating equipment. Very few railroads have yet installed what may be considered adequate exhaust ventilating equipment in their coach finishing shops. This problem, however has been given serious consideration by such organizations as the Equipment Painting Section of the American Railway Association and the Railway Fire Protection Association.

The process of applying finishing materials in different industries has involved a special problem in each industry; in fact, in each shop or factory. In attempting to collect data which would be of benefit to our readers, members of the staff of the *Railway Mechanical Engineer* have made investigations as to the methods employed and the facilities used in other industries in connection with the application of finishing materials by the spraying process. Owing to the fact that this process has found its widest application in the automotive industry it was expected that a study of the methods used in automobile body plants would disclose



Typical installation of wall and roof fan system for room in the corner or end of the car shop—Shown by the National Fire Protection Association

the lacquer. Instructions on these points are given in detail in various publications of the National Fire Protective Association.

In considering the conclusions arrived at by authorities that have given a great deal of thought and study to the problems of eliminating these hazards, attention is immediately directed to the fact that the installation of properly designed ventilating equipment in the shop will, at one and the same time, tend to obviate practically all the danger that may be attendant upon the application of modern finishes by the spraying method. Having accepted this conclusion, the next problem which demands attention is a consideration of the proper type of ventilating equipment which should be installed in modern railroad shops to provide adequate protection in the course of spraying operations.

The finishing of railway equipment involves the application of a protective coating to the surfaces of passenger coaches, locomotives and tenders, and freight cars. Because of the fact that the finishing of passenger cars involves the major portion of the immediate problem, this article will deal primarily with the equipment necessary in the paint shop for adequately protecting workmen engaged in finishing or refinishing.

Up to the last year or two the application of finishing material by the spray method has been carried on in railroad passenger car shops on a more or less experimental basis involving the finishing of only a portion some information that would be of value in the passenger car shops. Two facts became immediately evident. First, that the finishing of automobile or motorcoach bodies can not, in any broad sense, be compared with the finishing of passenger cars; second, that the automobile industry has accepted as conclusive—possibly as the result of several disastrous fires— the absolute necessity of safeguarding operations by the installation of adequate ventilating equipment.

In many railroad shops even in large passenger-car shops, the application of varnishes and lacquers to passenger cars has been carried on by the spray method in the open shop. In other cases, exhaust ventilating equipment has been installed which is designed to ventilate a rather large shop area merely by exhausting the air from several locations in the shop which in some cases have been quite remote from the actual point of spraying. It is this practice which has been subjected to some criticism on the part of the Railway Fire Protection Association and the representatives of fire insurance underwriters.

Exhaust Systems

The design of exhaust equipment should be such as to remove almost immediately, the vapors from the work area and, to be considered effective, the ventilation should be such as to eliminate any back-spray or haze about the operator's head. The ventilating system should also carry off all of the solid particles of the

coating material which do not adhere to the surface upon which it is being sprayed. In order to afford the greatest possible protection to workmen it has been considered advisable to conduct all indoor spraying operations within especially constructed non-inflammable spray booths equipped with exhaust ventilation. The velocity of the air in spray booths or tunnels varies between 60 and 200 linear feet per minute depending entirely upon individual conditions surrounding the installation. In railroad work some of those who have studied the problem consider 100 ft. per min. the minimum.

The drawing shows the method of installing ventilating equipment where spray finishing operations on passenger cars are being conducted in rooms separated from the remainder of the shop by walls of fire resisting construction. This drawing embodies the recommendations of the National Fire Protection Association. Owing to the fact that the spray vapors are heavier than air, they tend to collect at low points in the room. For this reason it will be seen that part of the air intake, under positive pressure, is delivered near the floor and that the exhaust fans set in the outside wall of the building are located near the floor line. Where spraying operations are carried on in an open room of this type the National Fire Protection Association recommends that provisions for exhausting the vapor from the room should be sufficient completely to change all air approximately every three minutes.

As far as specially designed exhaust-ventilation facilities for railroad coach shops are concerned, the installations to date have not been sufficiently numerous to consider them in other than an experimental way. In general, however, the systems which have been developed so far which are applicable to railroad work may be designated as (1) the tunnel-type car exhaust, and, (2) stationary canopy type car exhaust and (3) the portable canopy type car exhaust.

Tunnel-type Car Exhaust

The tunnel-type of exhaust ventilation for railroad shop work is an adaptation from the automotive plant. The equipment consists of an enclosure of sufficient height, width and length to segregate all of the spraying operations on a car of the greatest length in service. The exhausting of the atmosphere within the tunnel is accomplished by means of vertical ventilating stacks to the outside air in which induced draft is set up by belt-driven airplane-type exhaust fans of non-sparking metal or indirect annular-type exhaust equipment.

In the sides of the spray tunnel windows are located at frequent intervals outside of which are located vapor-proof electric lighting fixtures which conform to the requirements of the National Electrical Code and the requirements of the fire underwriters. The construction of the interior of the tunnel is such as to make all surfaces readily accessible for frequent cleaning and, in addition, the tunnel is equipped with an automatic sprinkler system.

The tunnel-type car exhaust has the disadvantage, however, of restricting that portion of the shop floor space over which it is installed to the use of painting operations exclusively inasmuch as the side walls of the tunnel extend to and rest upon the shop floor.

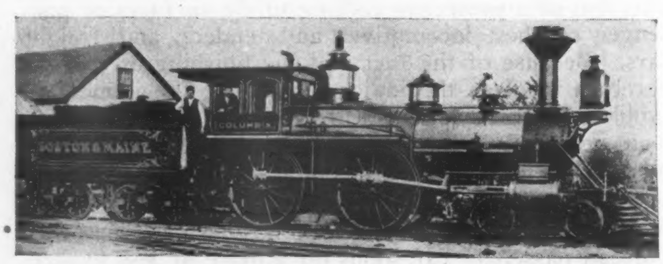
Stationary Canopy-type Car Exhaust

A more recent development of ventilating equipment for coach shops is to be found in the stationary canopy type car exhaust, examples of which are to be found in the shops of the Cincinnati Street Railway Company. In this type of installation, the exhaust hood or canopy is suspended above the track space on which the spraying operations are performed. The construction is such that it may be readily installed to provide ventilation over one or more cars. Located in the floor of the shop adjacent and parallel to the rails are long, narrow continuous floor slots from which, by means of motor-driven blowers located beneath the floor, thin streams, or curtains of air flow upward along the sides of the car with a velocity sufficient to remove the fumes and odors which result from spraying operations. The canopy is designed to collect the vapors which are blown upward by the air curtains and exhaust them in a short direct movement to the outer air. The exhaust is effected by straight vertical ventilating stacks in which induced draft is set up by belt-driven airplane fans of non-sparking metal. The motor is located in all metal pent houses on the roof of the shop building, entirely isolated from the path of the vapors. Where the belt enters the duct it is enclosed in a vapor-proof metal housing. Hinged panels on the under side of the canopy are so arranged that they may be thrown outward against the outer panels of the canopy in such a manner as to provide a solid canopy over the car roof to provide complete exhausting of vapors which may arise as a result of spraying operations on the roof of the car. When used in this manner, panels underneath the exhaust stacks are opened in the inner walls of the canopy to provide a direct movement of the vapors from the interior of the canopy to the stack. This type of exhaust canopy, like the tunnel-type, is equipped with both the close-head and open-head sprinklers.

Portable Canopy-type Car Exhaust

Probably the most recent development in exhaust equipment especially designed for railway coach shops is an adaptation of the stationary canopy-type constructed in such a manner that it may be installed in longitudinal shops to move lengthwise over one or more cars located on the shop track, suspended on a traveler. In principle, the operation of the portable canopy is similar to that of the stationary type. The narrow slots providing the air curtain along the sides of the car are located at the lower end of a frame-work which is built integral with the canopy and traveler. Blowers provide the air for blowing the vapors up alongside the car into the canopy exhaust opening. The exhaust outlets of the canopy are arranged in such a manner that the canopy may be spotted by means of a motor-drive with automatic control and stop switch at fixed locations so that the exhaust openings from the canopy coincide with vent stacks through the roof to the outer atmosphere. The draft for exhausting the vapors is provided in essentially the same manner as in the stationary canopy. An advantage of the portable exhaust equipment is that adjustable scaffolding is built as a part of the traveler. The absence of side walls in either of the canopy type equipments permits the utilization of natural lighting.

* * *



4-4-0 type Boston & Maine locomotive "Columbia"—Engine No. 59

Air Brake Association Convention

Papers on rail motor-car brakes and automatic train control equipment show enlarged scope of air-brake department work

A TOTAL of 929 members and guests registered at the thirty-sixth annual convention of the Air Brake Association, which was held in the Hotel Stevens, Chicago. The program occupied four days, April 30 to May 3, 1929, inclusive and included three addresses, four committee reports and seven papers, not including a number of committee reports pertaining to the administration of the association. An excellent program of entertainment was arranged by the Air Brake Appliance Association, which included excursions to various points of interest in and around Chicago, theatre parties during the day for the lady guests, and entertainment in the evening. The annual grand ball was held Wednesday evening, May 1. A total of 58 manufacturers had equipment, products, or descriptive literature on display at the exhibit of the Air Brake Appliance Association which is held in conjunction with the convention of the Air Brake Association.

Officers of the Air Brake Association

At the opening of the convention, after the invocation, Irwin R. Brigham, vice-president, North American Car Corporation, addressed the convention in behalf of the Chicago Chamber of Commerce. President H. L. Sandhas, general inspector, Central Railroad of New Jersey, followed Mr. Brigham with the customary presidential addresses in which he spoke of the need of the association maintaining its reputation as an educational organization. He said that the association must achieve its purpose; namely, high efficiency in air brake service in order to keep it in creditable standing in the railroad industry. It was only through actual accomplishment, that the railroads could be induced to send their men to conventions.

The presidential address was followed by a short business session, after which the convention heard the committee report on "What is the best material for air brake and air signal piping?" A summary of this report and the ensuing discussion is included in this report of the convention. Other papers and reports were presented on the following subjects: Distributing valves —Location, maintenance and piping, by the St. Louis Air Brake Club; Automatic speed control and automatic train-stop equipment, by F. H. Nicholson, engineer, Union Switch & Signal Company; Slid flat wheels in passenger train service—Causes and remedies, by the Pittsburgh Air Brake Club; Operation and maintenance of engineman's brake valve, by the Central Air Brake Club; Gas-electric rail car brakes, by the Northwest Air Brake Club; Car retarders, by L. Richardson, mechanical superintendent, Boston & Maine; Maintenance of brake equipment on gas-rail cars, by the Manhattan Air Brake Club, and three committee reports on recommended practice, main reservoirs, and exclusion of dirt and moisture from passenger brake cylinders.

Election of Officers

W. W. White, supervisor air brakes, Michigan Central, was elected president of the Air Brake Association to succeed H. L. Sandhas, general inspector, Central Railroad of New Jersey. W. H. Clegg, chief inspector, air-brake and car-heating equipment, Canadian National,

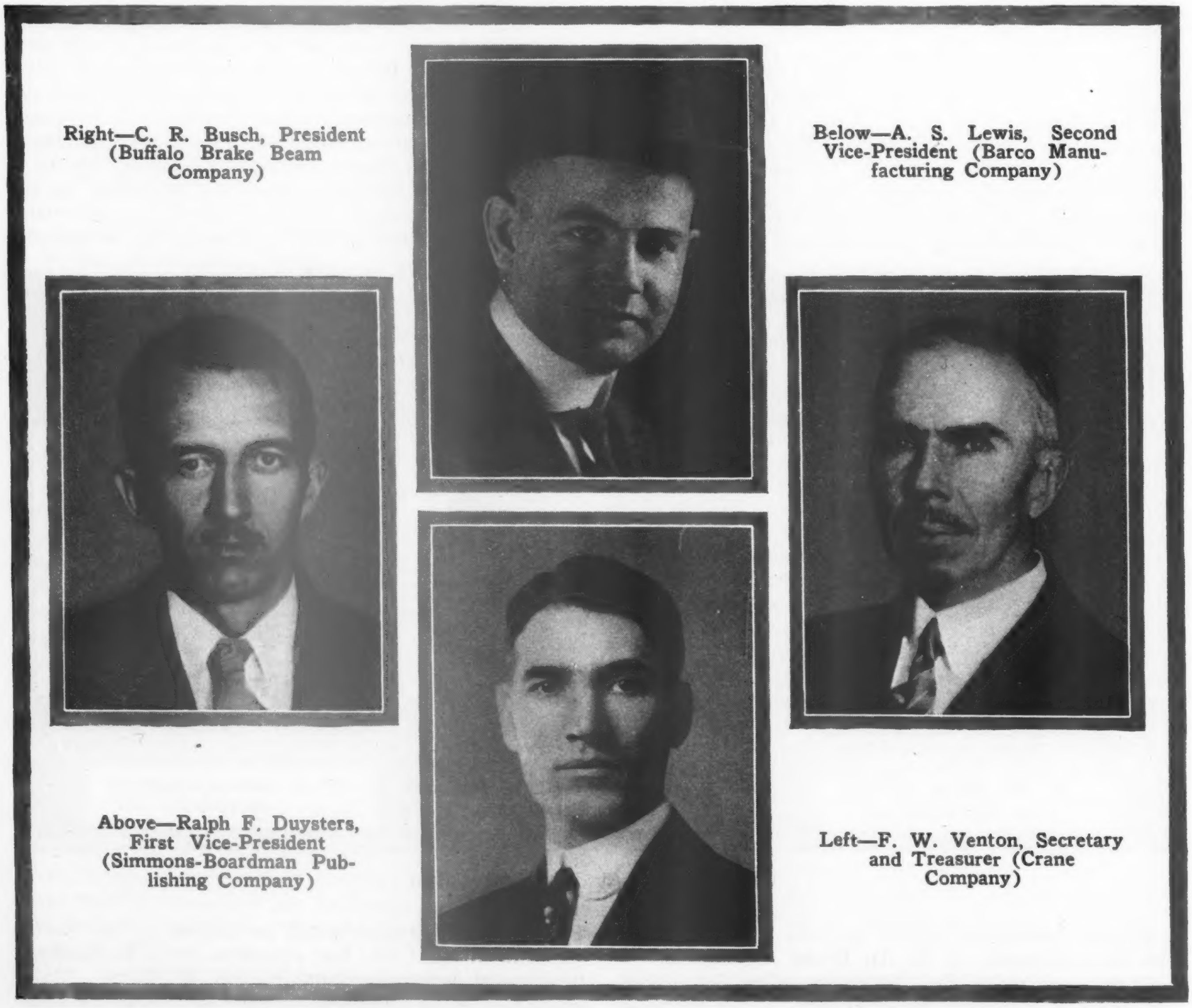
was elected first vice-president; R. M. Long, supervisor air brakes, Pittsburgh & Lake Erie, second vice-president; W. F. Peck, supervisor air brakes, Baltimore & Ohio, third vice-president; T. L. Burton, air-brake engineer, New York Central, secretary; and Otto Best, Nathan Manufacturing Company, treasurer. The following members were elected to the Executive Committee; C. H. Rawlings, general air-brake instructor, Denver & Rio Grande Western; E. Z. Mann, general mechanical instructor, Atlantic Coast Line; E. Von Bergen, general air-brake, lubricating and car-heating engineer, Illinois Central; J. E. Gardiner, general air-brake inspector, Boston & Maine, and John P. Stewart, general air-brake supervisor, Missouri Pacific.

The Air Brake Appliance Association held its annual meeting at the Hotel Stevens, Thursday, May 2, 1929, with Charles R. Busch, Buffalo Brake Beam Company, presiding. The question of depriving associate members the privilege of voting was discussed and it was decided that members of the association enrolled as associates should have all privileges of the association, but that of voting.

The following officers were elected for the ensuing year: President, R. F. Duysters, Simmons-Boardman Publishing Company, who succeeds Mr. Busch; first vice-president, A. S. Lewis, Barco Manufacturing Company; second vice-president, H. A. Flynn, New York Air Brake Company, and secretary-treasurer, F. W. Venton, Crane Company. The newly elected members of the Executive Committee are: R. H. Jenkins, Nathan Manufacturing Company; S. A. Witt, Detroit Lubricator Company; Donald Charlton, Wilson Products Co., Inc.; E. H. Weaver, Westinghouse Air Brake Company; J. A. Galligan, Union Railway Equipment Company, and E. G. Busse, Chicago Railway Equipment Company.

Address by John M. Fitzgerald

The principal address of the convention was delivered at the morning session on Wednesday, May 1, by John M. Fitzgerald, assistant to the chairman of the Committee on Public Relations of the Eastern Railroads, who spoke on "The Price of Transportation Insurance." Mr. Fitzgerald emphasized the fact that we led the world in mass production and we must have mass transportation in order to meet the demands of the national distribution of our products over long distances. There is no other method, he said, for rendering this service



Right—C. R. Busch, President (Buffalo Brake Beam Company)

Below—A. S. Lewis, Second Vice-President (Barco Manufacturing Company)

Above—Ralph F. Duysters, First Vice-President (Simmons-Boardman Publishing Company)

Left—F. W. Venton, Secretary and Treasurer (Crane Company)

Officers of the Air Brake Appliance Association

that is comparable with our railroads. The improved service of rail carriers is the backbone of our present prosperity. Not only has it permitted liquidation of inventories, he pointed out, but less merchandise is now being stocked, less money is being borrowed and much less interest paid. An enormous volume of capital has been released and is available for still further expansion of commerce and for permanent investment.

In discussing the various factors pertaining to government regulations, Mr. Fitzgerald said that not only are the railroads regulated by public interest, but that they are regulated by different governmental agencies. One branch of government tends to establish the highest possible valuation for railway property as a basis for railway taxes and another set of officers are trying to prove that the same property has little value in a rate proceeding. In other words, the efforts of both sets of officers tend to prevent the carriers from earning a fair return on either the highest or lowest value claimed by any public authority. In the meantime, he said, the public demands that ever increasing efficiency shall be accompanied by continued rate reductions, while wages and taxes continue to increase, and the carriers are forced to share existing business with competitive transport agents, which are subsidized with public tax monies. And the marvel of the situation is that, in spite of all these demands, the railroads continue to render the highest standard of service at the lowest cost, with the lowest capitalization and the greatest efficiency of any railroads in the world.

Best Material for Air-Brake and Signal Piping

The committee appointed by the Executive Committee to investigate the best material for air-brake and air-signal piping, began its work during February, 1928. This subject was investigated by another committee which reported at the annual convention held in Los Angeles, Cal., in May, 1925. It was, however, decided to reopen this subject and the present committee was instructed to investigate the present status of air brake and signal system pipe material and pipe manufacture; the comparative value of different pipe materials from a manufacturing standpoint, from a cost standpoint and from standpoints of installation and service results. It was also instructed to submit evidence and data which would permit the association to base conclusions bearing on the economic value of pipe used for these two purposes.

The committee prepared two sets of questionnaires which were sent to pipe manufacturers and to the railroads, respectively. The replies received were so varied that the committee was unable to arrive at any definite conclusions. Several of the pipe manufacturers submitted written discussions of the merits and claims for the various kinds of pipe offered. However, the committee reported that many of the claims made were contradictory, especially those which involved the characteristics of pipe behavior under conditions of corrosion and vibration. Reference is also made in the report to a number of tests which were being made by certain railroads with cars equipped with different kinds of pipe which operate in a service where considerable pipe trouble has been experienced. Each of the cars being used in this test has been fitted with two or more kinds of pipe and they have been in service now for approximately eight months.

The committee was continued. The report was signed by J. E. Gardiner (chairman) air brake inspector, Boston & Maine; J. A. Burke, assistant air brake supervisor, Atchison, Topeka & Santa Fe; R. M. Long, supervisor of air brakes, Pittsburgh & Lake Erie; W. W. Shriver, air brake inspector, Baltimore & Ohio, and R. E. Miller, assistant chief engineer, Westinghouse Air Brake Company.

Discussion

One of the members of the committee in discussing this report pointed out the difficulty of segregating commodities in order to make a complete test of piping on freight cars. He also stated that the manufacturers were producing a better quality of pipe for railroad service than heretofore.

Several of the members expressed their belief that the committee should do more in the way of investigating piping on locomotives as the number of pipe failures on cars was insignificant as compared with the number of failures on locomotives. One railroad in Canada has been compelled to go into heavy installations of copper piping on locomotives in order to reduce the number of pipe failures. One of the causes for this has been the fact that locomotives designed for high-speed freight service invariably had pipe failures when placed in high-speed passenger service. It appeared to be the consensus of opinion that more attention could be given by locomotive designers to the location of piping on locomotives. Reference was made by several speakers to a test which was made on a locomotive on the Pennsylvania, on which the piping was installed with the engine cool. After the installation was completed, the engine was fired up and the pipe bends were heated with an acetylene torch, which expanded the various lengths of pipe approximately 3/4 to 5/8 in. This expansion was then taken up by the pipe fitters. This experimental installation has proved satisfactory in service.

Distributing Valves, Location, Maintenance and Piping

Contributed by the St. Louis Air Brake Club

The paper reviewed the transition period of changing the locomotive air-brake schedule from A-1 to ET, when it became the general practice to locate the distributing valve on the reverse lever bracket, to attach it to the locomotive frames or to the wind sheets at a point adjacent to the tail piece. With a more complete understanding of the moisture present in compressed air and the effect of precipitation on the operation of the distributing valve, such as breaking down lubrication, carrying and depositing foreign matter and freezing in cold weather, there has been a tendency to locate the valve at some higher point on the locomotive.

A number of railroads have been following the practice of installing this valve on a bracket fastened directly to the boiler on the right hand side of the locomotive, and ahead of the firebox, where no interference with staybolts is encountered. This location is approximately on a direct line opposite to the air compressors, when they are located on the left side of the locomotive. In this location, the distributing valves, air compressors, main reservoirs, brake valves and piping are all attached to the boiler; an installation wherein the possible strains on the piping created by expansion and contraction are practically eliminated. This loca-

tion was recommended by the committee which prepared the paper.

In the discussion of this paper some of the members disagreed with the location of the distributing valve as recommended. Several spoke of difficulties encountered with a long pipe between the brake and distributing valves. Several speakers reported that no trouble had been encountered with distributing valves located under the running board. A speaker from a Canadian railroad reported that the distributing valve on his road was located on the tail end of the frame, and comparatively little trouble had been encountered with pipe breakage. This speaker, however, pointed out that his road used extra-heavy pipe brackets. However, it appeared to be the opinion of the majority of those present that, if the distributing valve was located on top of the boiler in front of the cab and care was taken in passing the valve over the ET test rack, most of the trouble in the operation of this valve would be eliminated.

Maintenance of Brake Equipment on Gas Rail Cars

Contributed by the Manhattan Air Brake Club

The Manhattan Air Brake Club confined its recommendations and instructions to the maintenance of the SME and AML equipments only. The paper included special instructions pertaining to the inspection of the equipment as a whole, instructions for daily inspection to both types of equipments and to air-signal equipment. Instructions were also given for periodic inspections of six months, twelve months and eighteen months. The committee which prepared the paper recommended that all rail motor cars be equipped with brake-cylinder gages; that all rail motor-car specifications state that foundation brake rigging shall be so designed that no part will bind or foul, and that the first point of fouling shall be the engagement of the non-pressure head by the piston, and that all rail motor cars be provided with metal tags or cab cards and the dates and place of 6-, 12- and 18-months' inspection recorded thereon.

Other Reports and Papers

The paper on the operation and maintenance of enginemen's brake valves, contributed by the Central Air Brake Club, contained a few pertinent extracts from the Interstate Commerce Commission rules and requirements pertaining to the maintenance of air brakes on locomotives. The Northwest Air Brake Club contributed a paper on gas-electric rail-car brakes, which was devoted largely to a discussion of the type of air compressors used on rail motor cars.

The Committee on Main Reservoirs presented a brief report of progress, which contained a chemical analysis of one of the wrought-iron main reservoirs mentioned in the committee's 1927 report. This reservoir which has been in service five years was removed and given a hydrostatic test. It was found to be nearly bottle-tight, although it contained both longitudinal and circumferential riveted seams. About thirty pounds of oily deposit was removed which contained 3.31 per cent moisture, 35.58 per cent oil, 56.2 per cent iron oxide and 4.82 per cent lime. While the inspection indicated that this reservoir was rusted, there was very little pitting and the plates were in good condition. This reservoir has been reheaded and returned to service.

The Committee on Recommended Practice submitted a brief report containing a number of changes, the most important of which was the location of air compressors on locomotives. The changes and additions recommended were adopted.

The committee appointed to investigate the subject of the exclusion of dirt and moisture from passenger-car brake cylinders, presented its final report at this convention. The committee reported that it was convinced that where cars are equipped with a device for protecting the cylinder against foreign matter, and a satisfactory lubricant used, the cleaning periods may safely be extended to two years or to the periods of shopping of passenger cars.

Slid-Flat Wheels in Passenger-Train Service

Contributed by the Pittsburgh Air Brake Club

The purpose of the paper was to list the most common cases of wheel sliding and to suggest a procedure which would help in the analysis of these problems and the application of the proper remedy. A large number of cases of wheel sliding are due to operating and track conditions, such as bad rail, slack action, switching cars at terminals and defective track. Two of the causes were maintenance problems; namely, defective brake rigging and defective brakes. Reference was made in the paper to the wide variation in braking ratio on cars, caused by improper design and construction of brake riggings. This, the paper states, contributes to unequal braking effort in different parts of the train and, where the braking ratio is high, will contribute to wheel sliding on that car. Considerable variation in braking power on different trains can often be traced to the non-uniform adjustment of piston travel. It is especially important that piston travel adjustment should be inspected and kept within close limits of the standard value during the winter season.

The most important brake defect responsible for wheel sliding, it was emphasized in the paper, are brakes which for any reason fail to release properly. The most common cause of failure to release is a leaky equalizing packing ring, and the importance of maintaining the air-tight fit of rings can not be overemphasized.

It was stated that a very important phase of brake equipment conditions, which has a direct relation to wheel sliding, is the synchronized brake action brought about by the use of proper chokes. Suitable chokes have now been provided for all passenger-brake equipment which will time the application and release uniformly throughout the train.

Other observations were made relative to brake repairs, train testing, and the paper concluded with a list of the primary and secondary causes for wheel sliding in passenger train service.

The inquiring reporter wandered into a railroad terminal a few hours after a locomotive had crashed into a bumper, the bumper evidently getting the best of it. Observing a rather confident looking master mechanic surveying the wrecked locomotive, the reporter asked what was to be done. "That's easy," replied the master mechanic. "We have another locomotive over here which had its rear end smashed. We will cut the wreckage off the front end of this one and off the rear end of the other one, weld the two of them together and produce an articulated mallet type locomotive." Well, stranger things have happened in the welding industry.—The Welding Engineer.

Annual banquet of the International Railway Fuel and International Railway Supply Men's Associations

Fuel Men Present Instructive Convention Program

Four railroad presidents and two heads of mechanical departments make addresses

IN one of the most instructive and constructive conventions of fuel men ever held, 2,200 members and guests of the International Railway Fuel Association gathered at the Hotel Sherman, Chicago, May 7 to 10, inclusive. Unquestionably the most important single feature of the convention was the addresses made by four railroad presidents and two mechanical department heads who, in a striking way placed their stamp of approval on the association and its work.

The International Railway Supply Men's Association, which holds an exhibit in connection with the convention each year, carried out an extensive program of entertainment for the ladies, consisting of theatre parties, luncheons and specially conducted tours in the afternoons, and dancing and vaudeville entertainment in the evening. The annual banquet was held Thursday evening, May 9.

The exhibit this year exceeded somewhat in number and variety of products displayed at the exhibition held in 1928. A total of 72 railway supply companies were represented at this convention as compared with 65 last year.

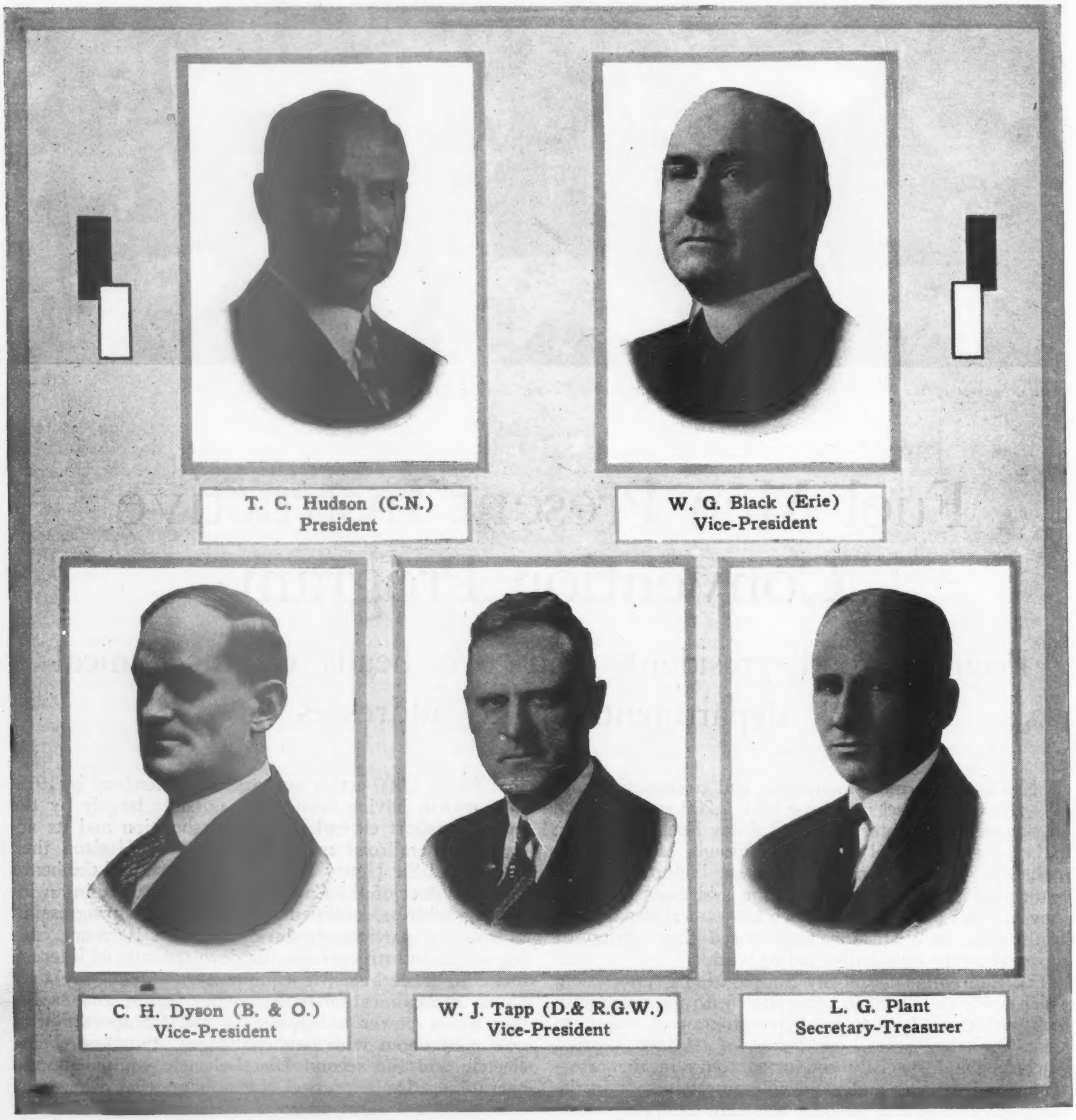
In opening the convention, President T. C. Hudson, assistant general superintendent of motive power of the Canadian National, Toronto, Ont., called attention to the rapid growth of the association from a membership of 35 in 1908 to 1,400 active and associate members in 1929, this growth having been made possible largely by the hearty support extended to the association and its activities by railroad managements. Mr. Hudson then introduced Sir Henry Thornton, chairman of the board and president of the Canadian National, who, in an inspiring address, outlined the remarkable progress in railroading, particularly during the past 10 years, calling attention to recent specific developments of interest, including Diesel-electric equipment and two-way telephone communication with moving trains, and saying that steam power as applied to rail transportation is now confronted with two challenges, the first being electric and the second Diesel-electric equipment and operation. He expressed the opinion that where the conditions are right, both of these methods will show marked operating economies, adding, however, that while other forms of energy may be developed and utilized as conditions warrant, "Old King Coal will still be doing business at the same old stand."

At the conclusion of Sir Henry's address, R. H. Aishton, president of the American Railway Association, reviewed the progress of American railroads in saving fuel, and said in effect that the day has passed when large economies can be secured with small effort. He indicated that railroad men must now climb the tree of

fuel economy and handpick the ripe apples one at a time.

J. B. Hill, president of the Nashville, Chattanooga & St. Louis, called the attention of the members to three vital reasons for fuel economy: conservation of natural resources, pride in a job well done and the attainment of fuel economies coincident with coal saving. T. C. Powell, president of the Chicago and Eastern Illinois, spoke briefly, maintaining that the country did not make the railroads but that the railroads made the country. He outlined the excellent service now being afforded by railroads, this service being absolutely dependent, in the main, upon the steam locomotive. He mentioned the limitations of complete electrification and of Diesel-electric operation, also outlining the problem which confronts the railroads, due to air, water and highway competition. He closed his remarks with the statement that nothing yet devised by man can take the place of steam-railroad service.

T. W. Demarest, general superintendent of motive power of the Pennsylvania, Western Region, delivered an instructive address, one of the principal points of which was an appeal for not only a further extension of locomotive runs, but an increased mileage of cars between yard stops for classification, inspection and repairs, this increased mileage being one of the most important single factors in fuel as well as other operating economies. A. P. Prendergast, mechanical superintendent of the Texas & Pacific, explained the part that the mechanical department has played in the promotion of fuel economy, not only in the design of locomotives but in their care



Officers of the International Railway Fuel Association

at engine terminals. He mentioned the importance of properly maintained boosters, feedwater pumps and other locomotive specialties as an important factor in fuel savings. A considerable portion of his address was devoted to direct steaming at engine terminals in which the steam obtained from live locomotives in the enginehouses is used in the work of firing up dead locomotives.

Election of Officers

At the closing session of the convention, the following were elected officers of the International Railway Fuel Association for the ensuing year: President, W. J. Tapp, fuel supervisor, Denver & Rio Grande Western, Denver, Colo.; vice-president, W. G. Black, mechanical assistant to the president, Erie, Cleveland, O.; vice-president, C. H. Dyson, fuel agent, Baltimore & Ohio, Baltimore, Md.; vice-president, J. M. Nicholson, fuel conservation engineer, Atchison, Topeka & Santa Fe, Topeka, Kan. Three new members were elected to the executive committee, which for the coming year will be as follows:

J. D. Clark, chief fuel supervisor, Chesapeake & Ohio, Richmond, Va.; H. Morris, superintendent of fuel and locomotive performance, Central Railroad of New Jersey, New York City; C. T. Winkless, fuel agent, Chicago, Rock Island & Pacific, Chicago; J. R. Jackson, engineer of tests, Missouri Pacific, St. Louis, Mo.; Malcolm MacFarlane, general fuel inspector, New York Central, New York City; A. B. Maurice, road foreman of engines, National Lines of Mexico, Mexico City, D. F.

The following were elected officers of the International Railway Supply Men's Association for the ensuing year: President, C. O. Jenista, Barco Manufacturing Company, Chicago; vice-president, S. A. Witt, Detroit Lubricator Company, Chicago; secretary, L. R. Pyle, Locomotive Firebox Company, Chicago; treasurer, C. M. Hoffman, Dearborn Chemical Company, Chicago.

A group of officers and committee members of the International Railway Supply Men's Association

Standing (left to right), J. E. Buckingham, Worthington Pump & Machinery Company, St. Louis, Mo.; C. H. Gaskill, Baldwin Locomotive Works, Chicago; assistant secretary-treasurer, W. J. Dickinson, Duntley-Dickinson Supply Company, Chicago; F. S. Wilcoxen, The Edna Brass Company, Chicago; Bard Browne, The Superheater Company, New York; C. L. Galloway, Hunt-Spiller Manufacturing Corporation, Boston, Mass.; E. J. Fuller, Hunt-Spiller Manufacturing Corporation, Boston, Mass. Seated (left to right), C. M. Hoffman, Dearborn Chemical Company, Chicago; secretary, S. A. Witt, Detroit Lubricator Company, Chicago; president, M. K. Tate, Lima Locomotive Works, Inc., Lima, Ohio; vice-president, C. O. Jenista, Barco Manufacturing Company, Chicago, and treasurer, L. R. Pyle, Locomotive Firebox Company, Chicago.

Members of the executive committee were elected as follows: C. H. Gaskill, Baldwin Locomotive Works, Chicago, for one year; J. W. Hulson, Hulson Grate Company, Keokuk, Iowa, for three years; F. C. Davern, Nathan Manufacturing Company, New York, for three years; and C. P. Rohow, National Refining Company, Chicago, for three years.

The Committee on New Locomotive Economy Devices reported that there appeared to be no outstanding demand for new devices, but rather a demand for the

perfection and more extensive use of devices already available. A summary of the replies to a letter sent out to the railroads by the committee indicated that the railroad managements are largely contented with the operation of the present-day locomotive equipped with such devices as are now on the market. However, the committee believes there is still room for many improvements in the design and application of specialties to add to the efficiency of locomotive operation, and plans to continue its efforts to seek further developments. It reported that the installations of feedwater heaters are about evenly divided between open and closed types. At the end of 1928, of 5,586 locomotive feedwater heaters installed or on order in the United States, Canada and Mexico, 5,155 have reciprocating pumps, 364 have centrifugal pumps, and 67 have reciprocating and centrifugal pumps. A total of 593 heaters installed or on order December 31, 1928, were of the injector type.

A considerable portion of the report was devoted to a discussion of the developments in the limited cut-off. The report states that there is no question but that many existing locomotives could be improved by redesigning the valve arrangement to the limited cut-off, and by the application of starting valves. A locomotive may be changed to this arrangement to have the same tractive force for starting, and such a locomotive would be able to haul trains at greater speed because the limited cut-off makes for a decreased steam consumption, and the resultant effect is an increase in the capacity of the boiler. Many locomotives in existence have too low a factor of adhesion. Such locomotives would benefit by the action of the starting valves and limited cut-off, and would not slip so readily. On existing locomotives, where it is possible to increase the boiler pressure or increase the cylinder bore, it is possible to increase the capacity for starting and hauling tonnage from ten to twelve per cent.

The report contained the description and results of a number of tests of a new device in connection with the limited cut-off which has been applied to a 2-8-2 type locomotive on the Monon. The locomotive selected for the first trial of the device was of the conventional long stroke cut-off valve arrangement. Mikado type, similar in proportions to the U. S. R. A. light Mikado design; weight on drivers, 218,000 lb.; total weight, 286,000 lb.; 28 in. x 30 in. cylinders, working at 170 lb. pressure, tractive force, 53,900 lb., and factor of adhesion, 4.04.

The 14-in. piston valves were arranged with 6-in. travel, 1 1/16-in. lap, 3/16-in. lead and 1/16 in. exhaust clearance. The valve ports were 1¾ in. The valve arrangement, as redesigned, is an improvement on the conventional arrangement in that the cut-off is limited to 65 per cent of the piston travel—that is now the longest cut-off than can be obtained with the locomotive. Other features of this arrangement are the improved valve events. The valve, because of the long lap necessary for the earlier cut-off, must be made to move faster in opening the port—this results in quicker full port opening and the valve holds the full port opening longer. This feature is especially pronounced when the engine is hooked up, and the result is to diminish the effect of wire drawing. The valve travel, in the new design, is lengthened to 7 in. The steam lap is 1 15/16 in., the lead is 3/16 in. and the valve ports are 2 in. The valves are designed with 1/16-in. exhaust lap.

The combination lever, of course, is changed to move the valve the distance imposed by the long lap. The total movement of the lap plus the lead is in this case 2⅛-in. while with the old arrangement it was 1¼-in.

It is possible to introduce exhaust lap with the limited cut-off arrangement without any harmful effect from excessive compression.

Fig. 1 shows valve diagrams at 26½ per cent cut-off. The larger of these being the limited-cut-off valve and the smaller one, of the original valve. The valve travel of the new design, at this position of reverse lever is 4¾-in., while it is 2 9/16-in. in the old design. The port opening of the former is 7/16-in. and of the latter, 9/32-in. The exhaust opening is greatly improved, as are all other points, as can be noted from the diagrams.

When a change, as described, is made in a locomotive, it of course reduces the mean effective pressure and therewith the tractive force in starting. There are two ways in which the change can be accomplished, and yet maintain the same power; one is to increase the bore of cylinders, the other is to increase the working pressure, or a combination of the two.

The change in the Monon locomotive was accomplished by increasing the boiler pressure 12 per cent or from 170 lb. to 190 lb. The locomotive will then have the same tractive force at 65 percent as with the old arrangement and the long cut-off.

The new device used with the limited cut-off on this engine consists of a starting valve designed to increase the mean effective pressure in starting and at slow speeds. This starting valve consists of a cylinder, or

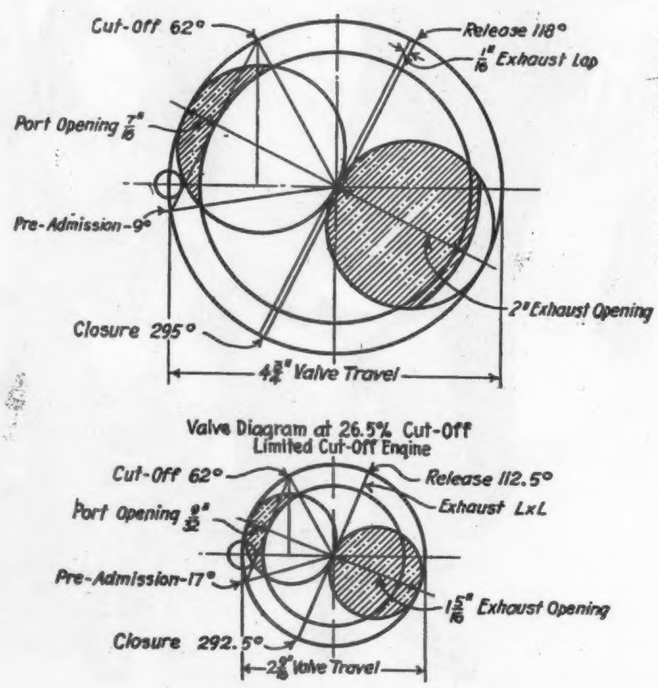


Fig. 1—Valve diagram at 26.5 per cent cut-off

body, with two valve bushings with a 2½-in. bore. The cylinder body itself is only about 10 in. long. In the cylinder a small plug-type piston valve operates to admit steam through the ports.

The starting valve is placed directly over the main valve chamber on the locomotive. A steam pipe, taken out of the main steam pipe or from the valve chamber as may be most convenient, is connected to the starting-valve body. From the starting-valve body are two 1¼-in. pipes connected to the main valve chamber through special tee fittings into the peep holes. This lets steam into the annular opening, or chamber around the main valve. This chamber is in direct communication with the cylinder at each end. When steam flows in through this starting valve it flows into the cylinder regardless of the fact that the main valves are closed. The starting valve

is constructed with ¼-in. lap and to cut off steam at about 90 per cent of the piston stroke. The effect of this starting valve is, that when it is applied to a limited cutoff locomotive, say 60-65 per cent or shorter, it changes the locomotive to a 90 per cent cut-off in starting or at slow speeds.

It has been found in actual work that the starting valve has the effect of increasing the power of the locomotive up to about six miles per hour.

The starting valve does not operate when the locomotive is running at ordinary speeds. Fig. 2 illustrates the application of the starting valve. The valve stem is connected to the link block of a miniature link. A bell-crank which is pivoted to the valve-chest head is made to lift the link. The lower end of the link is connected with a rod to the radius rod. That causes the link to swing whenever the engine is moving. When this bell crank is swung down to its lowest position the pins in the bell-crank arm and in the valve stem are in line and the valve stem, of course, does not move. The other arm of the bell crank is connected to the end of the piston rod of a small air cylinder. The air pressure to this cylinder is controlled by a foot pedal in the cab which is virtually a three-way valve.

When the operator steps on this foot valve the air pressure will force the piston out, raise the bell crank, and with it the link, to a fixed position which is limited by the travel of the piston in the little air cylinder and is just sufficient to give the starting valve a 1½-in. stroke.

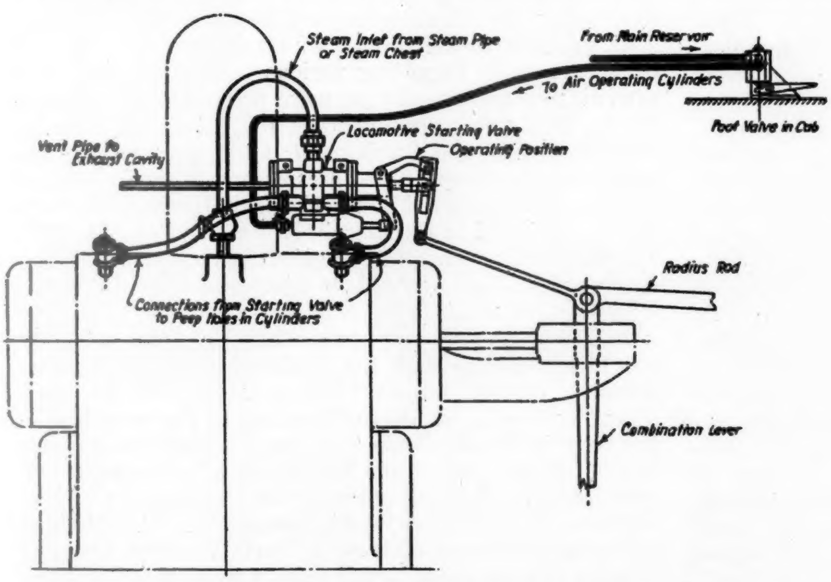


Fig. 2—Diagram illustrating the application of the starting valve

It was found in trials of this Monon engine, changed to limited cut-off and equipped with starting valves, when it was coupled to a train of 10 per cent more tonnage than is assigned to this class, with the lever in the forward corner and the throttle partly open, that it could not move the train. It was further proved, that if the engineman placed his foot on the starting-valve control, thereby changing the engine to a long cut-off engine, it would start the train readily.

This locomotive is No. 528, Monon J-1 class. It was found that the engine does not slip readily because of the small steam pipe to the starting valve. An engine usually starts to slip with the cranks on the quarter, that is, with cranks standing at 45 degrees from dead center. This quarter slip can be watched by the engineman and if it gets to be excessive all he needs to do is to ease his foot off the starting valve control and the engine does not lose its hold on the rail and spin the drivers. After engine No. 528 was changed to the limited cut-off type and equipped with this valve, the tractive force remained the same at 65 per cent cut-off. When the starting valve is in operation, the engine is changed to 90 per cent cut-off and the tractive force increased to 60,000 lb. The factor of adhesion is now about 3.64 and such an engine would be expected to be very slippery.

Road Tests on Monon Locomotive No. 528 (Limited Cut-Off) Against Other Locomotives (Long Cut-Off) of the J-1 Class

	Eng. 528	Eng. 525	A-Rating Class J-1 Engine	Eng. 528	Eng. 510
Tonnage, Louisville to McDoel with J-1 pusher over 25 miles of heavy grade..			1100	2388	2209
Tonnage, McDoel to Wallace Jct.	1672	1509	1500	1693	1497
Tonnage, Wallace Jct. to Bainbridge	1882	1742	1700	1928	1697
Tonnage, Bainbridge to Lafayette	3085	2856	2800	3086	2836
Per cent over A rating.....	10½			10.25	
Distance, miles	103	103		200	200
Actual running time, hrs., min.	4.55	4.59		9.53	9.59
Number of stops	10	6		22	18
Gals. of water used (running)	15,000	17,000		29,875	31,675
Lb. of water per 1000 gross ton-miles	503	620		555	649
Water saved, per cent......	19			14½	

It was found that by limiting the size of the feed pipes in the starting valve, the flow would not be great enough to cause the engine to spin the drivers or rarely to lose hold, and yet it was sufficient to increase the tractive force up to about six miles per hour.

A number of tests were run to check up on the effect of the change under operating conditions. This locomotive has a tractive force of 11 per cent more than the engines of the same class. With that in mind the tests were run to determine the locomotive's ability to handle that much additional tonnage and to determine the economy due to the limited cut-off. The results are summarized in the table.

The report also covered such specialties as water-circulating devices, back-pressure gages and cut-off control, air locomotive whistles, improved cab devices, the use of pulverized coal on locomotives and the development in locomotive stokers. One of the interesting subjects which the committee included in its report was a smoke-observation window. This window is a clear-glass opening, 8 in. in diameter, located just above the storm window in front of the cab on the left side. The purpose of this window is to permit observation of the stack from the fireman's seat box. It is well known that a good stoker fireman can regulate his fire by the color of the stack. This window can be applied at a cost of a little over $2 and has met with the approval of the men working on locomotives on which it has been installed. With this window, the fireman can observe the stack from his seat in the cab.

The report was signed by George E. Murray (chairman) electrical and mechanical engineer, Grand Trunk Western; J. P. Christiansen, mechanical engineer, Chicago, Indianapolis & Louisville; John R. Jackson, engineer of tests, Missouri Pacific; E. A. Kuhn, engineer of motive power, New York, Chicago & St. Louis; W. A. Pownall, mechanical engineer, Wabash; H. W. Sefton, supervisor locomotive and fuel performance, Cleveland, Cincinnati, Chicago & St. Louis; S. R. Tilbury,

fuel supervisor, Atchison, Topeka & Santa Fe, and G. A. Young, Purdue University.

Front Ends, Grates and Ash Pans

The report of the Standing Committee on Front Ends, Grates and Ash Pans was limited to the presentation of two subjects; namely, the use of material other than plain cast iron for locomotive grate bars, and the results of locomotive front-end tests recently made on the Missouri Pacific. The committee sent out a questionnaire to which replies were received from 59 railroads which operate 52,953 locomotives, or about 75 per cent of the total number in service. This questionnaire covered the utilization of materials other than cast-iron; experience with the material used and, if cast-iron grates were used, what were the specifications? The answers to this questionnaire showed that of the 59 roads replying, 40 buy or make cast-iron grates without any specifications for physical or chemical properties. These 40 railroads own 24,481 locomotives. It was stated in the report, that while the absence of specifications does not necessarily entail poor material, especially for roads which cast their own grates, it certainly does not make for excellence or uniformity of product. The remaining 19 roads buy or make their cast-iron grates according to specifications, two of them specifying physical properties only. These 19 roads own 28,472 locomotives. Of the 19 specifications received in response to the questionnaire, nine were the same as the specifications for locomotive grate bars adopted by the American Society for Testing Materials.

All of the roads using materials other than cast iron for grate bars; such as cast steel and various iron alloys, reported satisfactory service, and a considerable number reported that special grate materials are more economical than cast iron.

The section of the report devoted to front-end tests on the Missouri Pacific described the work done by that road in an effort to establish a standard front-end arrangement for its 2-8-2, 2-10-2, 4-6-2 and 4-8-2 type locomotives. These series of tests included, in addition to the establishment of a standard front-end arrangement, a study of the improvements produced by eliminating restrictions in the exhaust passages, a study of the performance of six-pronged and four-pronged Goodfellow exhaust nozzles, and a study of front-end performance on a passenger locomotive with special regard to trailing smoke.

The main conclusions arrived at as a result of these tests were that there are great possibilities of improving steam production and decreasing back pressure by means of larger nozzle tips, provided other parts of the front-end design are well worked out; that an increase in stack diameter will often result in improved performance; that for engines of the size and capacity of those now in common use, the old style lift pipe is unsatisfactory, and that the inside stack is more effective than the lift pipe; that in order to secure the benefits available from large nozzles, care must be taken to remove restrictions elsewhere in the exhaust passages; that the Goodfellow nozzle seems superior to the plain tip, and that the six-pronged Goodfellow tip is not generally as good as the four-pronged tip.

The report was signed by Edward C. Schmidt, University of Illinois, (Chairman); George W. Armstrong, Bethlehem Steel Company; W. R. Beasom, Pennsylvania; H. A. Boyer, assistant shop superintendent, Erie; J. S. Breyer, master mechanic, Southern; E. C. Fogh, Texas & Pacific; V. L. Jones, mechanical engineer; G. H. Likert, fuel engineer, Union Pacific; J. L. Ryan, mechanical and testing engineer, St. Louis-San Francisco; L. W. Withrow, chief motive power inspector, Chesapeake & Ohio; E. G. Young, University of Illinois, and Frank Zeleny, engineer of tests, C. B. & Q.

Other Addresses and Reports

In this year's report on the inspection and preparation of fuel the committee included a form of report for the initial mine inspection of coal and also a daily mine-inspection report. Considerable space was devoted in the report of the committee to mechanical cleaning and washing, satisfactory results with the latter method, particularly in the Alabama fields, being secured.

The Committee on Stationary Power Plants in its report this year presented a program of subjects for development in future reports to which it plans to devote its attention. These subjects include stokers and furnaces, stacks and breechings. small and auxiliary turbines, power-plant records and logs, superheated steam, coal and ash handling, coach heating, location and protection of enginehouse piping, recommendations regarding electric blowers, central-station vs. isolated-plant operation, and power-plant building construction. This year's report also included information concerning the operation of oil-fired power plants with reference to air, steam and mechanical atomization, and the use of oil and steam flowmeters for securing knowledge of plant operation.

In addition to the reports of standing committees individual reports regarding various coal conferences and activities of the association were presented, as follows: W. L. Robinson, superintendent of fuel and locomotive performance of the Baltimore & Ohio, presented in abstract form a report of the International Bituminous Coal Conference, sponsored by the Carnegie Institute of Technology, and held at Pittsburgh, November 19 to 24, 1928. H. W. Brooks, consulting engineer, gave the convention the benefit of his observations while attending the World Fuel Conference at London in the fall of 1928.

Addresses were also presented by H. L. Gandy, executive secretary of the National Coal Association, speaking on the subject "Where Mine and Railroads Meet," and by L. K. Sillcox, assistant to the president of the New York Air Brake Company, on the general subject of "Proper Air Brake Maintenance." Committee reports on the following subjects were presented: "Steam Turbine Locomotives," Chairman, L. P. Michael, mechanical engineer, Chicago & North Western, Chicago; "Diesel Locomotives," Chairman, Clarence Roberts, assistant road foreman of engines, Pennsylvania, Philadelphia, Pa.; "Oil Firing Practice," Chairman, C. I. Evans, chief fuel supervisor, Missouri-Kansas-Texas, Parsons, Kan.; "Coal Firing Practice," Chairman, C. P. Dampman, supervisor fuel conservation, Reading, Philadelphia, Pa.; "Fuel Distribution and Statistics," Chairman, J. M. Nicholson, fuel conservation engineer, Atchison, Topeka & Santa Fe, Topeka, Kan.; "Fuel Bulletins," Chairman, P. E. Bast, fuel engineer, Delaware & Hudson, Albany, N. Y.; "Fuel Stations," Chairman, J. W. Tarbox, fuel station supervisor, Chicago, Rock Island & Pacific, Chicago; "Inspection and Preparation of Coal," Chairman, Malcolm MacFarlane, general fuel inspector, New York Central, New York City; "Coal-Fired Power Plants," Chairman William Olsen, supervisor power plants, New York Central, New York City; "Oil Fired Power Plants," Chairman, R. W. Hunt, fuel supervisor, Atchison, Topeka & Santa Fe, Los Angeles, Cal.

Boiler Makers Meet at Atlanta

Addresses by A. E. Clift and L. R. Powell are features of twentieth annual convention—Reports on welding and corrosion

A NEW precedent was established in the annals of the Master Boiler Makers' Association this year when it held its twentieth annual convention at the Atlanta-Biltmore Hotel, Atlanta, Ga., May 21 to 24 inclusive. This was the first time in its history that the association has met below the Mason-Dixon line. Although the attendance was somewhat less than in former years, the program presented at the convention was of unusual merit. About 200 master boiler makers, 125 members of the Boiler Makers' Supply Men's Association, 60 guests and 125 ladies were registered. The program was featured with addresses by two railroad presidents; A. E. Clift, president, Central of Georgia, and L. R. Powell, Jr., president, Seaboard Air Line. Other addresses were made by R. B. Hunt, mechanical engineer, Florida East Coast; O. A. Garber, chief mechanical officer, Missouri Pacific, and John M. Hall, assistant chief inspector, Bureau of Locomotive Inspection.

L. M. Stewart (A.C.L.)
President

Geo. B. Usherwood (N.Y.C.)
First Vice-President

K. E. Fogerty (C. B. & Q.)
Second Vice-President

H. D. Vought
Secretary

The officers and members of the Southern and Southwestern Railroad Club were the guests of the association at the Thursday afternoon session, when Mr. Powell and Mr. Hall spoke. A moving picture and lecture on "Failure of Steel Boiler Plates, Its Causes and Suggested Remedies," was presented at this session by H. L. Miller, metallurgist, Central Alloy Steel Corporation.

Committee reports were presented on the following subjects: Recommended practice and standards for fusion welding as applied to steam pressure boilers; Boiler corrosion and pitting, and what can be done in the boiler department to relieve the condition; What are the best methods for application, maintenance, and general repairs of syphons on locomotive boilers? What is the best known practice for finding water levels on locomotives, when applying boilers to the frame or when new back heads are applied?; What can be done to standardize the design of beading tools, flue rollers, expanders, taps, reamers, the size of pneumatic hammers and motors for the different classes of work, spring bars, vises, solid bars and weights for holding staybolts, etc., used in boiler construction and repairs?; Does high pressure, long runs and stoker firing increase or decrease the life of the firebox or boiler, and how does it effect the operating cost of the locomotive?; How much benefit is derived from the use of steel staybolts instead of iron, and hollow staybolts instead of solid, both flexible and rigid, in locomotive boilers?; Have cold-drawn flues and cold flanged firebox plates an advantage in service as compared with hot-drawn flues and hot flanged plates?; What benefit is derived from annealing or heat-treating firebox sheets prior to application?; Topics for the 1930 convention.

A total of 57 manufacturing companies had products or descriptive literature on display at the annual exposition of the Boiler Makers' Supply Men's Association, which is held in connection with the convention of the Master Boiler Makers' Association. The supply men's association also arranged an excellent program of entertainment for the members and guests which consisted of entertainment and informal dancing on Tuesday and Wednesday evenings, a southern barbecue and outing on Wednesday afternoon, and the annual banquet, Thursday evening.

President Stewart, general boiler inspector, Atlantic Coast Line, in his presidential address at the opening session, brought out the thought that attendance at conventions meant the pooling of ideas and methods of building and repairing steam boilers. This was now more important than ever before, due to the rapid de-

velopment of boilers carrying high steam pressures, and the increase in long locomotive runs. The methods and duties he said, that have been required of the boiler maker foreman have become more intricate with the introduction of the modern locomotive. The fabrication of heavier and higher tensile-strength plates and staybolts has added difficulties to the work, which requires ability, efficiency and precision in carrying out the details of each operation.

Following are summaries of some of the principal addresses and reports:

A. E. Clift's Address

Improvements to locomotives, Mr. Clift said, must precede rather than follow other improvements to the railroad plant. The whole theory of operation of the steam railroad is centered around the boiler, for without adequate boilers it is impossible to have a steam railroad.

He pointed out, that there is room for all three forms of transportation—railroad, automobile and aeroplane —because each has certain definite advantages, but expressed the belief that the railroad will continue to be the backbone of this country's transportation system. Railroad men need never fear for the future of their industry as, while the automobile and the aeroplane, as well as the barge line, can supplement, they can never replace the railroad. Considering the advantages of the railroads to the shipper and traveller, he said that it offers the greatest possible safety, continuity of service and permanency of schedules.

The railroad continues to operate, he said, under weather and climatic conditions that make dangerous, or impossible, the operation of aeroplanes, automobiles or bus lines. The railroads' advantages of speed, reliability, independence of weather and economy of operation assure their remaining for a long time to come, the principal means of getting freight from place to place.

Mr. Clift expressed the belief that eventually passenger traffic will be divided among the automobiles, the aeroplanes and the railroads—automobiles for those moving relatively short distances, the air line for those demanding great speed, and that the railroads will continue to handle the great majority who value the comfort, convenience, safety and protection which the railroad affords.

Address of L. R. Powell, Jr.

In his remarks Mr. Powell stressed the necessity of making savings in material and in labor in conducting locomotive maintenance operations. He went on to state:

"Material purchased for use is a definite subtraction from the treasury. If it is not used, it is a dead loss. If it is not properly used or does not serve the purpose for which it was purchased, it is a partial or a total loss. In 1928, with the gross revenues of something over six billion dollars, nearly a billion and a quarter dollars were spent for maintenance of equipment which, of course, included labor as well as material. From this you will note that the money spent for maintenance of equipment was approximately 20 per cent of the gross revenues of the railroads and equalled the net return earned on their capital investment.

"There is an erroneous opinion current, even among

Officers of the Boiler Makers' Supply Men's Association

Left to right (standing), W. H. Dangel, Lovejoy Tool Works, secretary (1929); J. C. Kuhns, Burden Iron Company, president (1929); (seated), F. C. Hasse, Oxweld Railroad Service Company, secretary-elect; I. H. Jones, Central Alloy Steel Corporation, vice-president-elect; Harry Loeb, Lukens Steel Company, president-elect; G. R. Boyce, A. M. Castle & Co., treasurer.

those who should be better informed, that railroads are owned by a small group of moneyed interests and that they are earning unreasonably large returns on the investment. Both of these views are false. While I have not the latest figures before me, I believe I am safe in saying that there are practically a million individual holders of railroad capital stock. These figures do not take into account the million or more railroad bondholders scattered all over the United States whose interest in the financial success of the railroads is equally as great as that of the stockholders.

"I wish to take this opportunity of placing before you a matter of greatest importance to the railroads and that is the continually increasing taxes which they are obliged to pay. For a number of years railroad taxes have exceeded railroad dividends. Taxes paid by railroads have increased nearly 300 per cent in the last 17 years, while dividends have increased something over 25 per cent. In 1911 the railroads paid taxes aggregating ninety-nine million dollars. In 1916 they were one hundred fifty-seven million. In 1928 they were three hundred ninety-five million, an increase of 300 per cent over 1911. More than three-fourths of these taxes are levied by state and local governments.

"May I ask that you give this condition your most earnest consideration, bearing in mind that not only should the distribution of the tax burden not bear unduly on the railroads, but that in the administration of your state and municipal governments an effort should be made to supervise expenditures so as to secure a dollar's worth for every dollar expended."

Other Addresses

R. B. Hunt, mechanical engineer, Florida East Coast, in addressing the convention at the session on Wednesday morning, referred to the intimate contacts of the master boiler maker with the mechanical-engineering department of the railroad with which he was connected, and also with engineers in other highly specialized fields of endeavor, such as combustion, hydraulics, compressed air, welding, etc. He pointed out that the operation of the boiler inspection laws practically make the master boiler maker and the mechanical engineer jointly responsible for changes in boilers, and repairs requiring an alteration report. Numerous other questions arise that have to be settled between them. This does not mean, he said, that the head of the department is circuited or side-stepped, but that the details are worked out and taken to him for his approval. In the many things that enter into the construction and maintenance of boilers, he said, whether it be a question of tools, methods of construction or maintenance of appurtenances—some of which are originated by the master boiler maker, some by other members of the railroad organization and some by manufacturers or their representatives—it is the combined knowledge of the different parties interested that has made possible the modern locomotive boiler.

Mr. Hunt then described the development in boiler-shop equipment, which he attributed largely to the development of the locomotive boiler itself and the addition of such appliances as superheaters, thermic syphons, arches, etc. He said that it was his understanding that the Florida East Coast was the first railroad in the southeast to have superheater equipment applied to its saturated steam locomotives. The use of the electric and acetylene welder, softened water, regular washing periods, Thermic syphons, feedwater heaters, combustion-chamber fireboxes and the use of a softening compound in boilers before washing, has increased the flue miles on the Florida East Coast from an average of 35,000 which was the limit before any of the appliances or materials mentioned were in use, until on April 30, 1929, the railroad had 56 locomotives which had made more than 75,000 flue miles, 19 with more than 100,000 flue miles and two with over 200,000 flue miles. The maximum, he said, was 245,096 flue miles.

In his address, A. O. Garber, chief mechanical officer, Missouri Pacific, said that to his mind, the two most important duties of the mechanical department of a railroad were to give service, and to maintain the equipment at the lowest possible cost. Mr. Garber stressed the point that the boiler was the foundation of the power in a locomotive, and should be given first consideration when a locomotive is passing through a backshop for general repairs. In elaborating on this point, he detailed the duties of the boiler-shop supervisors and inspectors from the time the locomotive is brought into the shop until it is marked O. K. for service. He referred to the tendency to go to higher boiler pressures and pointed out that this development meant steel of greater strength and heavier plates. He said that it was one of the duties of the master boiler maker to be able to sell to the management the idea that proper tools should be furnished in order to maintain this material economically and to successfully build and repair large boilers. Mr. Garber referred to the effort that is being made by various railroads to give efficient instruction to boiler-maker apprentices. He said that the result would be more competent boiler makers and the type of mechanics which the management should make a special effort to retain in the service of the railroad.

As has been customary in recent years, the courtesy of the floor was extended to a group of water-service engineers in order that they might explain the advances recently made in combatting boiler corrosion and pitting. Among these, Dr. C. H. Koyl, engineer of water service, Chicago, Milwaukee, St. Paul & Pacific; R. M. Johnson, supervisor of water supply, Chesapeake & Ohio; R. E. Coughlan, Chicago & North Western and several others outlined the work being carried out in this connection on railroads all over the country.

Dr. Koyl in his remarks outlined the three most common methods of preventing corrosion and pitting; namely, the use of caustic soda in the boiler water, the Gunderson method, which consists of keeping the iron coated with metallic arsenic to prevent the excess of hydrogen ions, through their only door of escape, the cathodic iron surface, and the exclusion of oxygen from the feedwater. He referred to a comparative test made on the C. M. St. P. & P. of two boilers, one of which was fitted with an open-type feedwater heater. At the end of 2½ years of service, over the worst pitting division on the road, not a mark was discovered on any tube of the locomotive equipped with the open type feedwater heater.

At that time, however, it was necessary to move the locomotive for a month's service to a district where only part of the water was treated. The mixture of soft and hard water caused so much foaming that the handling crew used the injector most of the time. When the locomotive was returned to the engine-house, two tubes were found pitted near the front end. These tubes were replaced and the locomotive put back in service in the district having entirely treated water. At the end of four years' service, January, 1929, the boiler was dismantled and every tube and flue, and the boiler shell was carefully examined. All the original tubes were in excellent condition and the two new tubes,

which were replaced, were also in the same condition. All of the tubes and flues, with the exception of the second-hand replacements, were safe-ended and put back in the boiler for another four-years service. During the four years of the test, the locomotive, which was not equipped with the heater, was reflued four times, and each time the boiler shop was only able to retip about 40 per cent of the flues.

Dr. Koyl in his conclusions said that it was evident that the presence of caustic soda in treated water has nearly eliminated corrosion of all kinds, and that the use of soda ash on the hard-water division between Perry, Iowa, and Council Bluffs, has nearly eliminated pitting. He said that he was firmly convinced that the exclusion of oxygen from the feedwater of any locomotive, in a treated-water district, will prevent all pitting and that an open-type feedwater, properly operated, will exclude enough oxygen for the purpose. It must be remembered, he said, that the occasional use of the injector will admit enough oxygen to cause some pitting on any district where pitting is naturally bad.

John M. Hall, assistant chief inspector, Bureau of Locomotive Inspection, in his address at the Thursday afternoon session, recalled the methods of 25 and 30 years ago that were used for inspecting, washing and maintaining locomotive boilers. With this as a background, he discussed the improvements that have been made since that time and referred to the co-operation that the Interstate Commerce Commission boiler inspectors received from the master boiler makers employed by railroads through the country, bringing about the excellent present-day conditions.

Committee Reports

The most important general discussion occurred in connection with the reports on fusion welding as applied to locomotive boilers. The subject was introduced by J. A. Doarnberger, master boiler maker, Norfolk & Western, who in his report made the following statements:

"Each year the decrease of radical innovations in the welding art, we believe, may be correctly interpreted as indicating a sane, normal progress and a healthy condition of stability that insures the art a more important position in industry as time passes. This does not mean, of course, that no further development is to be expected; on the contrary, now that the primary experimental stage is definitely a thing of the past, and as the application of the art has become more general, and as more minds consequently are focused upon the subject, we should expect a uniform and gradual progress —a progress that will differ from that of the past, in that instead of being marked with startling innovations, it will consist of a cumulative series of gradual refinement of practices and extension of applications.

"On all sides we find evidence that this phase of the development of the welding art is already well under way. As an illustration, we will consider an example of boiler construction that in its field is probably the outstanding accomplishment of the past year, and with which a number of you are already familiar. The case referred to is that of the 2-8-8-4 type single-expansion articulated locomotive, built for the Northern Pacific by the American Locomotive Company.

"There are a total of 229 ft. of welded seams in the firebox, and in addition, a total of 575 ft. of external welding; and 169 ft. of internal welding in the barrel section of the boiler as a sealing feature at seam edges; making a total of 973 ft. of welding employed in the construction of this boiler.

"It is quite gratifying to your committee that the development of welding is now apparently being carried along conservatively. Fewer hit-or-miss methods are being employed, but our past experience has been sufficiently broad to enable us to study the question scientifically and we may expect from now on definite and steady progress; and it is essential that no stumbling block be put in the path of this development."

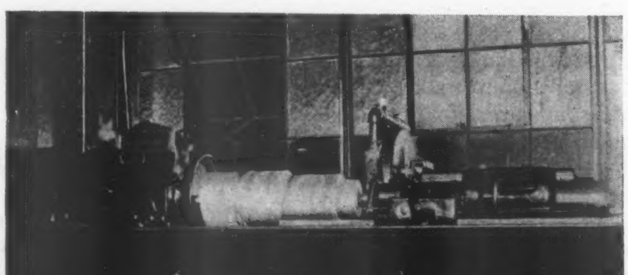
The subsequent discussion from the floor of the convention stressed the importance of maintaining careful supervision over the welders and conducting frequent efficiency tests of their work. The human element is the determining factor in the matter of safe welding and while, in general, better results are now being obtained on locomotive work, there are still many examples of poor welding where supervision has not been maintained. A warning was sounded by representatives of the Bureau of Locomotive Inspection to proceed with the utmost caution in applying the process to boilers.

Election of Officers

At the meeting Friday morning the following officers were elected for the coming year: President, George R. Usherwood, supervisor of boilers, New York Central, Syracuse, N. Y.; first vice-president, Kearn E. Fogerty, general boiler inspector, Chicago, Burlington & Quincy, Aurora, Ill.; second vice-president, Franklin T. Litz, general boiler foreman, Chicago, Milwaukee, St. Paul & Pacific, Milwaukee, Wis.; third vice-president, O. H. Kurlfinke, boiler engineer, Southern Pacific, San Francisco, Cal.; fourth vice-president, Ira J. Pool, district boiler inspector, Baltimore & Ohio, Baltimore, Md.; fifth vice-president, L. E. Hart, boiler foreman, Atlantic Coast Line, Rocky Mount, N. C.; secretary, Harry D. Vought, 26 Cortlandt street, New York; assistant secretary, Albert F. Stiglmeier, general foreman boiler maker, New York Central, Albany, N. Y., and treasurer, W. H. Laughridge, general foreman boiler maker, Hocking Valley, Columbus, O. Albert F. Stiglmeier was elected chairman of the executive board.

The following officers were elected at the annual meeting of the Boiler Makers' Supply Men's Association, which was held Thursday, May 23. President, Harry Loeb, Lukens Steel Company; vice-president, Irving H. Jones, Central Alloy Steel Corporation; secretary, Frank C. Hasse, Oxweld Railroad Service Company, and treasurer, George R. Boyce, A. M. Castle & Co.

* * *



A modern piston-rod gap grinder finishing a large crank pin for a Santa Fe type locomotive

The Reader's Page

The Shop Window Cleaning Problem

MASSACHUSETTS.

TO THE EDITOR:

We believe that a clean, bright shop will be reflected in better performance on the part of the employees, resulting in increased efficiency and economy. To this end we are giving the interiors of our shops a thorough coating of white paint. The problem that promises to give us the most concern, however, is to find the cheapest and best way of cleaning windows—and keeping them clean. If we resort to ordinary methods, we find the process slow, laborious and costly. I am wondering whether any of the readers of the *Railway Mechanical Engineer* know of devices which are in use that will reduce the labor cost and at the same time guard against dripping surplus water on work benches or machines. Possibly this is not the right kind of problem to propound to your readers, but we believe that railroad shop supervisors, generally, will be keenly appreciative of any advice as to the most efficient and economical methods which are used for this purpose.

SHOP SUPERINTENDENT

Opportunities with the Railroads Will Continue

PITTSBURGH, PA.

TO THE EDITOR:

I read the editorial entitled "Is There a Future with the Railroads?" which appeared in the April, 1929, issue of the *Railway Mechanical Engineer* with a great deal of interest. There are four items in connection with this subject which I do not note mentioned in the editorial.

First, it is common in all industries for the individuals employed in that industry to think that their lot is not as desirable as it would be if they were engaged in some other line of work. Each industry thinks its problems are somewhat greater than found in some other industry with which the individual is not so well acquainted. Emerson said something to the effect that "the sails of distant ships are always white." This expresses it very well, because it is human nature to think that the other man has an easier time.

The second item is that the railroad industry is no different from practically every other industry in speculating as to what the future may hold. With modern research, new inventions, and new development, all industries are subject to radical change and even to complete disappearance in time. The railroad industry, as we view it, is perhaps in a better position in this respect than many other industries. What effect the next 25 or 50 years will have is most difficult to predict.

The third item is that railroad equipment for well on to 100 years did not involve any radical design changes, the development being mainly the production of larger units. During this time, the railroad industry probably was the largest metal fabricating manufacturing system. With the development of the automotive and other industries, all this was changed. It would appear that there is room for much development in applying the information gained in other industries to further development of railroad equipment; for instance, experiments under way with Diesel engines, turbine-driven locomotives, etc., suggest that radical changes in locomotive equipments are possible.

In the same way, it might be expected that metallurgical advances will lead to extensive changes in the use of materials now employed. Indeed, it seems that there should be an intensive development of railroad equipment to take advantage of the lessons learned by the research carried on by many different industries. As you suggest, such a development would require a somewhat different type of effort than has been in order on railroads in the past. Certainly it would seem that the possibilities in this direction should be an incentive to all young men looking toward the future.

The fourth item is that the railroad future appears to be better secured than almost any other industry. The capital investment in railroads is so enormous, and this capital has been supplied from so many diversified sources, as life insurance companies, savings banks, investment funds of all descriptions, etc., that it does not appear that it could be diminished without serious economic injury to the country. In other words, if the railroads were to be displaced by newer forms of transportation, it would appear that this substitution should be accomplished over a very long period of years in order that economic difficulties might be avoided to the greatest extent. It would appear that the time required for such a substitution is so long that present employees should not fear the future of the railroad industry.

JOSEPH C. MCCUNE,
Assistant Director of Engineering, Westinghouse Air Brake Company

Suggested Designs for Tank-Valve Screens

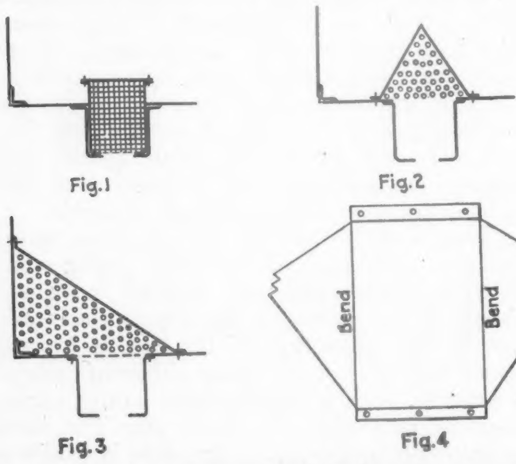
LORAIN, OHIO.

TO THE EDITOR:

The discussion started by A. T. E. on tank valve inspection on the Readers' page of the December, 1928, issue of the *Railway Mechanical Engineer*, contains many possibilities that are of importance in the problem of tender tank maintenance. The design of tank valve screens is one of these. Figs. 1 and 2, referring to the sketch, show the types of valve screens that are now in general use on tanks where the outside valve is secured

to the valve well. The screen in Fig. 1 is made of netting, flanged at the top, to which a cover, also made of netting, is bolted. This screen fits snugly in the well but soon deteriorates because of the impact of the water. The screen used in Fig. 2 is made of copper alloy metal, about 20 gage, and is shaped in the form of a cone. It is fastened to the floor of the tank by four studs. However, this material is also too light, and is not sufficiently substantial to withstand the impact of the water.

In reply to the editor's request for constructive ideas, I am proposing a more substantial design of tank valve screen, which is shown in Figs. 3 and 4 of the sketch. This screen should be made of not less than ¼ in. steel plate. It is fastened to the front wall of the tank and to the floor witth studs, as shown. The perforations



Figs. 3 and 4 show the proposed design of tank-valve screen

in the plate used for the screen should not be less than 3-16 in. This design of screen offers practically no resistance to the surge of water ordinarily met with in the water-leg type tank. It is advisable, however, to flange the bottom edges of the screen plate for fastening to the floor, for application to tenders where the front of the tank extends across the width of the tender. Fig. 4 shows a layout of the screen before bending or drilling. The notches, shown at the extreme ends, fit over the angle at the wall and the floor connection.

Joseph Smith

New Blood Needed in Railroad Organizations

New York.

To the Editor:

I read with a great deal of interest your editorial entitled "Is There a Future with the Railroads?" which was published in the April, 1929, issue of the *Railway Mechanical Engineer*. Periods of transition, such as described in your editorial and through which we are now passing, are discouraging to all of us. However, it seems to me that you have overlooked one important point; namely, the need for railroad managements to look outside of their own organizations for competent men, as well as to promote those within their own ranks.

We frequently read about "weak" roads being consolidated or merged with "strong" roads. There are a lot more weak roads than there are strong ones. The strong roads appear to be blessed with competent men all the way down the line, while the weak roads seem to lack men of ability. Therefore, it is my belief (and I am familiar with the organizations of many railroads) that one of the principal reasons railroading is so discouraging is that there is little opportunity for a man working on one road to get a better job on another. It is a difficult matter, if you are employed on a railroad that is well blessed with competent personnel, to transfer to another which is not so fortunate, and where you can use your experience and talents to greater advantage.

The idea of taking care of the faithful in one's own organization is quite laudable, but it is not always to the best interests of the company. That is one objection I have to the policy of hiring a large number of college men as special apprentices each year, with the object of training them to become foremen and supervisory officers. The railroad is under certain obligations to take care of these men. Usually there are more special apprentice graduates awaiting promotion than there are vacancies. So the possibility of obtaining a man or two trained in another organization is remote. It is my opinion that this system of training is the primary reason that a number of railroads in this country are living under a personnel system that is being handed down from one generation to another.

Why so many railroads insist on a policy of only promoting men who have been trained in their own organization is a puzzle to me. The up-and-coming manufacturing companies make no secret about looking anywhere and everywhere for the right type of man to fill a certain position in their organization. In fact, there are several instances in which good men have been induced to leave railroad work; the result of just that policy. Why can not the railroads do the same thing?

There may be a future with *a* railroad, but not with *the* railroads. If I have the capacity to absorb the red tape and hand-me-down ideas of the railroad with which I am working, and also to acquire a few "new and improved" ideas at the same time, there is a possibility of my being promoted. Perhaps, I am qualified to hold down the job of shop superintendent. Perhaps I can do a much better job than the man who is in line for such a position on a neighboring railroad. Perhaps the management of that road is acquainted with the fact. But, what chance have I ever to get that job? There is your future with the railroads.

As I said before, taking care of the men in your organization is a praise-worthy policy, but it seems to me that a great many roads would be far better off if they would occasionally take in some new blood, if for no other reason than to renew their vigor and get some new ideas into their system. It would not only benefit the railroad industry, but would make the future of competent railroad men brighter.

An Ex-Railroad Man

The Canadian Pacific and the New York Central each are having built a double-pressure steam locomotive, with which a fuel saving of 20 per cent, as compared with the present modern locomotive types, is anticipated. The indirect method of steam generation will be used in the high-pressure portions of the boilers, in which working pressures of between 800 and 900 lb. will be carried. The low-pressure portions will carry pressures of between 200 and 250 lb. High-pressure steam will be used in one cylinder, and the exhaust from this cylinder, combined with steam from the low-pressure section of the boiler, will supply the two low-pressure cylinders of each locomotive. Steam from both sections of the boilers will be superheated, and the locomotives will be equipped with a closed type feedwater heater.

NEW AND IMPROVED MACHINE TOOLS AND SHOP EQUIPMENT . . . .

Developments in Machine-Tool Design

THE appearance of this issue, the thirteenth annual Shop Equipment Number of the *Railway Mechanical Engineer*, marks the passing of another year in the development and refinement of machine tools and shop equipment suitable for railway shop utilization. The trend of machine-tool design has continued to be one of refinement although more new designs of machine tools suitable for railway use have been placed on the market this year than during the past two years. The outstanding developments in refinement have been greater ease of manipulation, increased durability through the use of alloy steel and heat-treated parts, the wider use of anti-friction bearings and better lubricating systems.

It is too early to expect any considerable effect on machine-tool design from the introduction of the new cutting alloys, but the decided trend towards the use of alloy steels in gears, spindles, and in fact all parts subjected to wear and heavy stress may be an indication of what is to come.

The lubricating systems of many tools have been redesigned to give either flood or full automatic lubrication. In most instances, the lubricant is forced through the oiling systems by a motor-driven pump. Oil filters of various kinds have been incorporated in the system to remove foreign matter. No machine tool is of modern design today in which the oiling of the bearings is dependent on the operator.

Considerable attention has been given to the cutting-fluid circulating system, with the objective of furnishing the fluid to the cutting tools in large quantities and of eliminating chips and dirt by the installation of filters. One builder has designed a fluid system so that not only will it supply ample fluid to the tool, but will also flush off the table surface.

Since the practice of working to close tolerances is growing among the railroads many builders have included in their machines alinement devices, some of which are used to check quickly the alinement of the machine as a unit and others for taking up the wear and the alinement of parts. Another aid in securing accuracy and the elimination of guesswork, is the inclusion of dial indicators for setting feeds and speeds.

The use of anti-friction bearings is rapidly extending to all types of machines. Several lathes have been designed with the spindle mounted in roller bearings. The gears of these lathes are made of high-carbon or alloy steel. The spindles of several milling and grinding machines brought out during the past year are also mounted in anti-friction bearings. Practically all of the armature shafts of built-in motors are mounted in either roller or ball bearings.

Refinements in Special Railway Tools

A two-spindle rod-boring machine appeared during the year, in which each spindle is separately motor driven and mounted in ball bearings. A 100-ton bushing press was redesigned to include a motor-driven sliding table on which can be mounted driving boxes for removing crown brasses. Included in a redesigned 90-in. axle lathe is a crank-pin turning attachment with which the crank pins of wheel sets from a three-cylinder locomotive can be turned. This machine includes a number of alloy-steel parts and also has anti-friction spindle bearings. Of particular interest is a car-wheel lathe arranged to handle wheel sets equipped with roller-bearing journals. The chuck has been designed so that it will hold either plain or roller-bearing journals for machining.

A large planer-type milling machine, on which there are four individually motor-driven cutter heads was placed on the market during the year. Alloy steels and anti-friction bearings are used extensively in this machine. An entirely new horizontal locomotive piston-valve boring machine was introduced into the railway field during the past year, as well as a 72-in.-stroke traveling-head cylinder planing and boring machine. An engine lathe, designed with an attachment for the machining of the bushings used in three-cylinder locomotives, is another development of the year.

Other Developments

In addition to the refinements already referred to, an important trend of the year is toward greater flexibility in the application of power by the use of multiple electric motors, each furnishing power directly for a single function, instead of a single motor driving through complicated gearing. Clutches are of greater capacity and better design, and work-handling devices are being built into the machines; consistent progress has been made in the application of push-button control for starting, stopping, jogging, traversing and feeding.

The use of alloy steels and anti-friction bearings were the two major refinements made in the many grinding machines placed on the market during the past year. One manufacturer has equipped its surface grinders with hydraulic feed. A special machine for grinding the chasers used in automatic die heads was designed by the manufacturer of the die heads. One company featured a machine for the grinding of several surfaces at one setting. An internal grinding machine for automotive work, on which is used a six-stone hone, has been adapted for grinding air-brake cylinders, air compressor cylinders, etc. Most of the grinding-machine manufacturers have increased the variety of sizes to their lines of standard machines.

The principal development in milling machines is the addition of spindle attachments for the purpose of increasing the utility of machines already in service. Anti-friction bearings are used in all these attachments.

In the field of electric welding the trend has been toward increasing the life of the electrodes and increasing voltages which permits the use of electrodes of larger diameter. One company has designed a water-cooled carbon electrode holder for use with the carbon-arc process of welding. Many designs of portable and stationary arc-welding sets have been made available. In the gas-welding field, refinements in design have been made to welding equipment, such as cutting and welding torches, acetylene generator sets, tips, etc. One company has placed on the market a specially designed tip for cutting out rivets so that they need not be backed out with a pneumatic tool.

In the material-handling field, heavier and larger sizes of lift trucks are offered by several manufacturers. The builders are continuing to design power-operated trucks to meet the conditions peculiar to railway service. An overhead traveling crane was placed on the market in which herringbone gears were used to reduce noise, friction, power consumption and gear wear. Roller bearings were used in all important parts and lubrication was made as nearly automatic as possible.

Putnam Quartering and Pin-Turning Machine

THE redesigned Putnam 90-in. combination quartering and pin turning machine recently placed on the market by Manning, Maxwell & Moore, Inc., 100 East Forty-second street, New York, will quarter two wheels at one setting, will turn two crank pins at the same time and will quarter one wheel and turn one crank pin at one time.

The machine consists of two separate self-contained units mounted on a substantial bed. Each unit may be used to bore pin holes or turn crank pins. Two pin holes may be bored or two pins turned simultaneously. Because of the unit construction, with the hole-boring and pin-turning functions built in one unit, extreme rigidity and accuracy are obtained. When wheel sets with a left-hand lead are to be machined, one hole is bored or one pin is turned at a time.

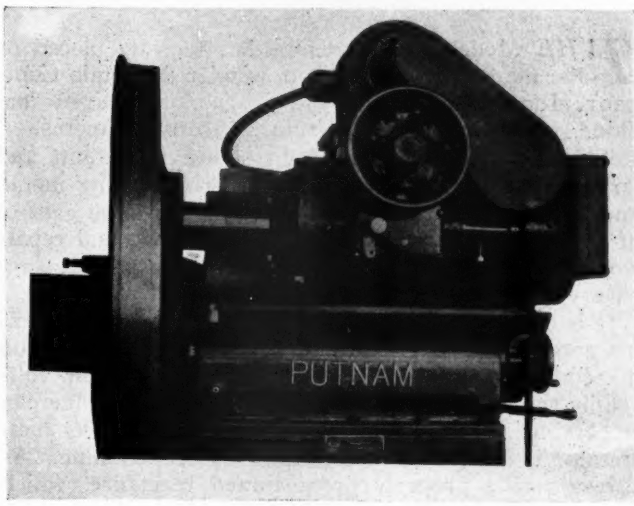
The wheel set is supported on large diameter centers with hand-wheel and screw adjustment mounted on the bases. The set is clamped in position by the adjustable yoke clamps.

Turning pins is accomplished by two large pots surrounding the pins which have two cutting tools mounted on the outer end. The tools are mounted in two adjustable plates for setting various diameter pins and each tool is independently adjusted by a screw to obtain a fine adjustment.

The machine is driven by a 5-hp. 3-1 adjustable-speed or multi-speed motor through a texrope drive and a worm and wheel. The worm wheel is mounted directly on the pot. The worm and wheel run in a bath of oil. Bronze and hardened and ground steel washers are used to take the thrust. The pot revolves in two bronze bearings, the rear one of which is 10¾ in. in diameter by 4 in. long. The front taper bearing is 15¼ in. in diameter at the large end and is 8 in. long. Take-up nuts are provided for adjusting the front bearing. The length over these bearings is 30 in.

The feed is driven from the outer end of the pot with gears and through two pairs of worms and wheels and sliding gears, all running in oil, to a rack pinion meshing with a rack mounted in the base. The feed is by a star wheel engaging a friction clutch. Hand adjustment of the tool pot along the base, for positioning the start of cut, is made by a hand-wheel.

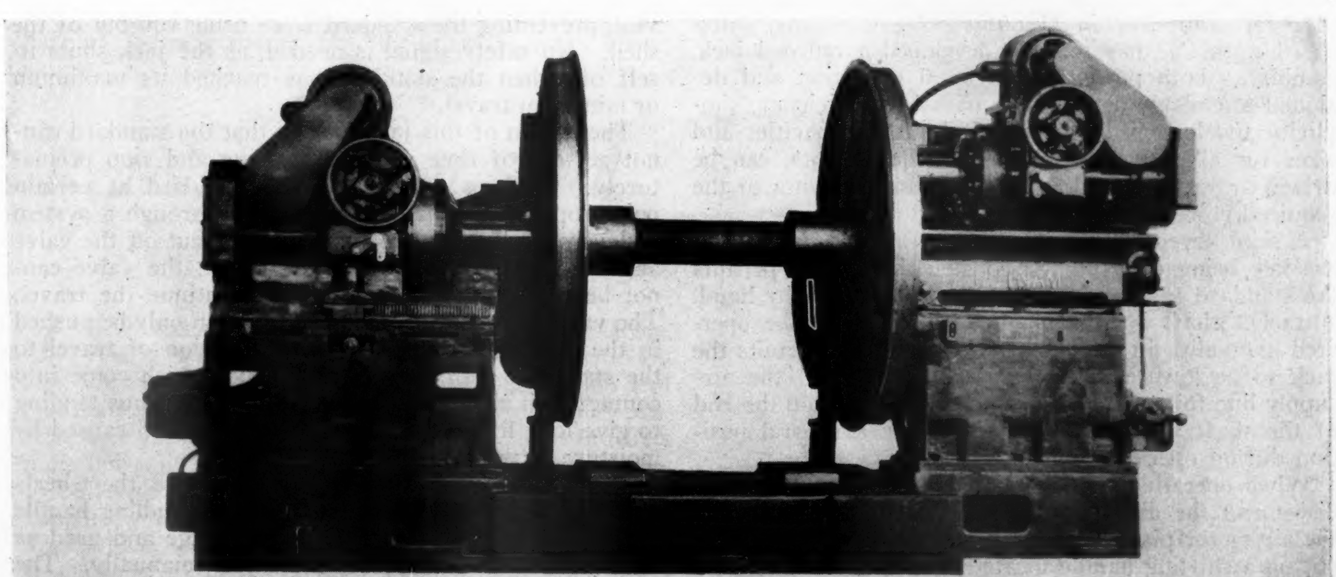
Setting for the stroke is done by adjusting one attachment vertically and the other horizontally by



Right head set-up for pin turning

means of screws. The units are mounted on a bed so that they are in an accurate position for quartering.

Boring pin holes is done by removing the tool-carrying plates used for the pin-turning operation and substituting a boring bar and support. The support is centered in the face of the pot and securely bolted and keyed thereto. The boring-bar shank fits into a tapered hole support 5¼ in. in diameter at the large end



Wheel set mounted and clamped—Quartering in the left head and turning the pin in the right head

with a taper of ½ in. per foot. A cross key is provided through the bar and support for driving the bar. With this rigid bar mounting and the long distance between the tool-pot bearings, it is not necessary to use an outboard bar bearing. Two 4½-in. diameter boring bars, one for each attachment, are furnished with the machine. Larger or smaller bars may be provided.

The motors recommended for this machine are two direct-current 5-hp. adjustable speed, 600-1,800 r.p.m. motors, shunt wound with non-reversing drum control, and for alternating current, two 5-hp. multispeed 600-900-1,200-1,800 r.p.m. motors with non-reversing drum control or with a drum for speed regulation and a start-and-stop push button and panel.

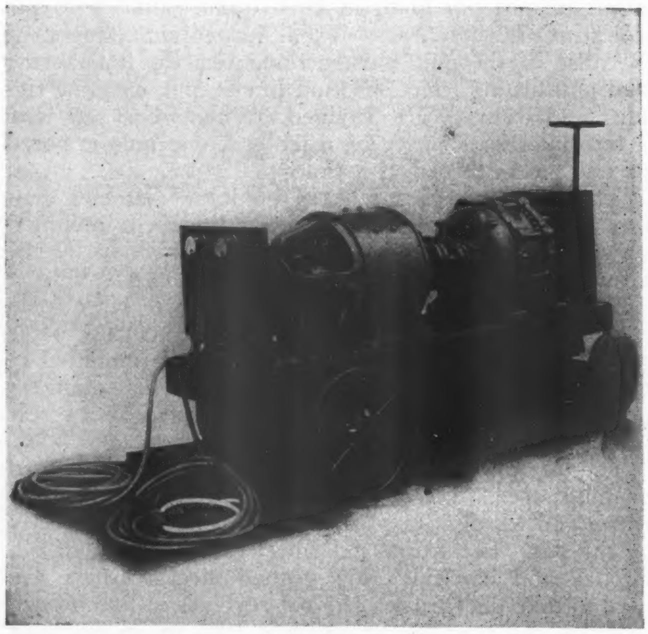
Wilson Model S Electric Welder

THE Model S portable welder, recently placed on the market by the Wilson Welder & Metals Company, Inc., Hoboken, N. J., is a motor-driven machine, which has a range from 20 to 600 amperes.

This machine is adapted both to heavy currents and large diameter electrodes for rapidly depositing metal, and also to a short arc with exceedingly close control of the welding current for strength welding and repair work. Because of close control and quick voltage recovery, the machine is suited for overhead welding.

It is equipped to give full welding range without extra apparatus. By simply setting the dial pointer on the control panel and adjusting the open-circuit voltage by the field rheostat, any desired current value can be obtained. The generator is self-excited, and its commutator is always the coolest part of the machine. As a result of a properly proportioned reactance, which automatically steadies the arc under all welding conditions, the arc is easy to start and easy to maintain, and as the current rises only slightly above 600 amperes on short circuit, the possibility of the electrode sticking to the metal is minimized.

The machine is capable of turning out work with metallic electrodes up to ½ in. in diameter, and with carbon electrodes up to ¾ in. in diameter.


Wilson portable electric welder which has a range from 20 to 600 amperes

Pneumatic and Hand-Operated Jack

THE Duff-Norton Manufacturing Company, Pittsburgh, Pa., has recently developed a railroad jack, combining both power and manual operation and designed to embody new factors of safety, efficiency, simplicity and long life. This jack, built in capacities and sizes for all locomotive and car requirements, can be driven by any standard make of pneumatic motor of the required power.

A semi-keyed standard is incorporated in the design, the key being of a unique construction which permits the standard to be quickly turned up or down by hand. A rachet shaft is fitted so that the jack can be operated manually, an important feature, which permits the jack to be lowered while under load, should the air-supply line fail. The lifting socket is carried on the end of the shaft, the pawl being placed in a neutral position during operation by air.

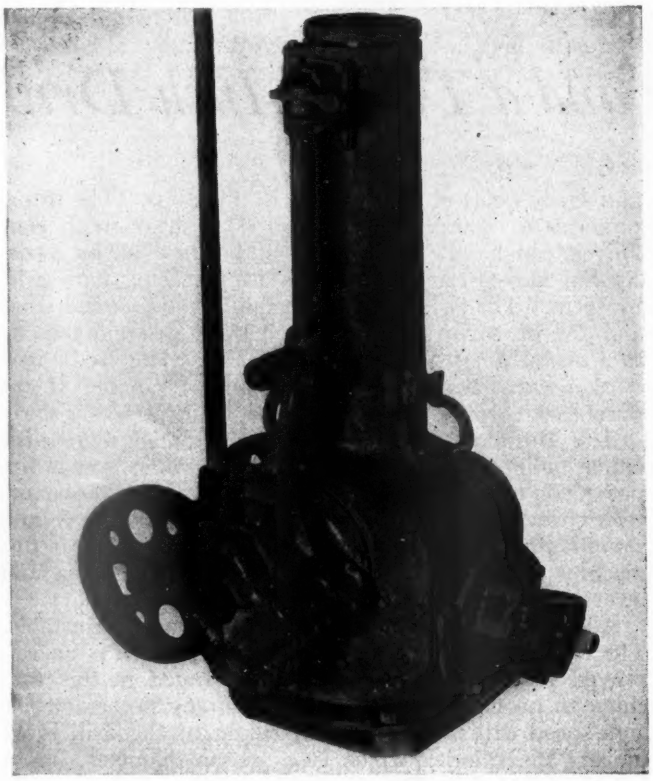
When operating the jack manually, it is necessary to disconnect the air motor on account of the "drag" of the air motor pistons. This is accomplished by pulling out on a shifting handle located near the lifting socket, thus disengaging a jaw-type clutch. The automatic shut-off arrangement on these jacks is one of the principal features and provides an effective safety-first device, preventing the standard from being run out of the shell. No safety signal is needed, as the jack shuts itself off when the standard has reached its maximum or minimum travel.

The design of this jack is such that the standard cannot get out of time with the gearing and stop prematurely. Grooves cut around the standard at certain points operate the hand-control valve through a system of levers, and, when the standard has shut off the valve at its upper or lower points of travel, the valve cannot be pushed in the direction to continue the travel. The valve locks out, so to speak, and can only be pushed in the direction to give opposite direction of travel to the standard. All parts of the valve which come into contact with air are made of stainless steel, thus tending to give long life and freedom from corrosion caused by moisture in the air supply.

These jacks come mounted on a carriage, the wheels of which are 10 in. in diameter. The trundling handle can be quickly removed from the carriage and used as a lifting handle for operating the jack manually. The socket of the carriage handle is adjustable, allowing the handle to be laid down out of the way. This adjustable feature also permits the operator to locate the jack un-

der the load easily. With this type of carriage arrangement, the lifting handle is always with the jack ready for instant use in case manual operation becomes necessary.

There are two separate compartments in these jacks



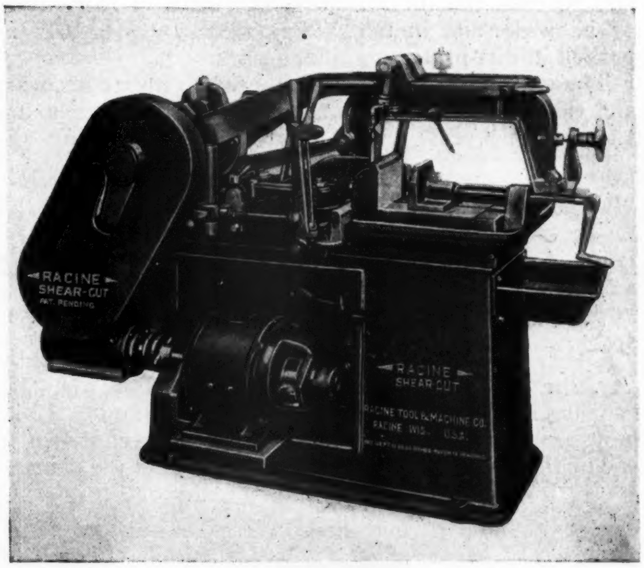
New Duff-Norton jack designed for power or manual operation

which need to be lubricated and each takes a different kind of oil. One of these compartments, the base of the jack proper, requires heavy lubricating or steam-cylinder oil, while the other, or the motor gear case requires a regular air-motor lubricant. Suitably filling plugs are provided and also oil level plugs. The lubricant supplied the air-motor gear case also lubricates the air motor. Tests show that the oil placed in the base of the jack thoroughly lubricates the main lifting screw.

Redesigned High-Speed Metal Cutting Saw

THE Racine Tool & Machine Company, Racine, Wis., has redesigned its shear-cut production saw for the purpose of improving its construction and eliminating vibration. In the new type of table construction the main shaft is supported by three brackets mounted solidly in the table. The former method was to bolt two of the brackets to the table, and the third supported the clutch end of the shaft with an auxiliary arm which was also bolted to the table. In effect, this means a wider table and a much more solid bearing for the main shaft of the machine.

The new screw-feed principle requires more power to draw the saw blade through the solid metal, as each



Model 20-C motor-driven Racine metal cutting-off saw

tooth in the blade is taking its own separate and individual chip. Thus, the pull on the saw blade is greatly increased and somewhat resembles the pull on a broach. The actual pressure of the steel against the saw blade, tending to bow or break the blade, is not any greater than was formerly applied by weights or springs in the machines of older design.

Thickness Gage Stock in Rolls

THE L. S. Starrett Company, Athol, Mass., has placed on the market a thickness gage or feeler stock in a convenient form for production operations where certain thickness or thicknesses are in constant use. The No.

Top: Thickness holder No. 806—Bottom: Starrett No. 666 thickness gage stock

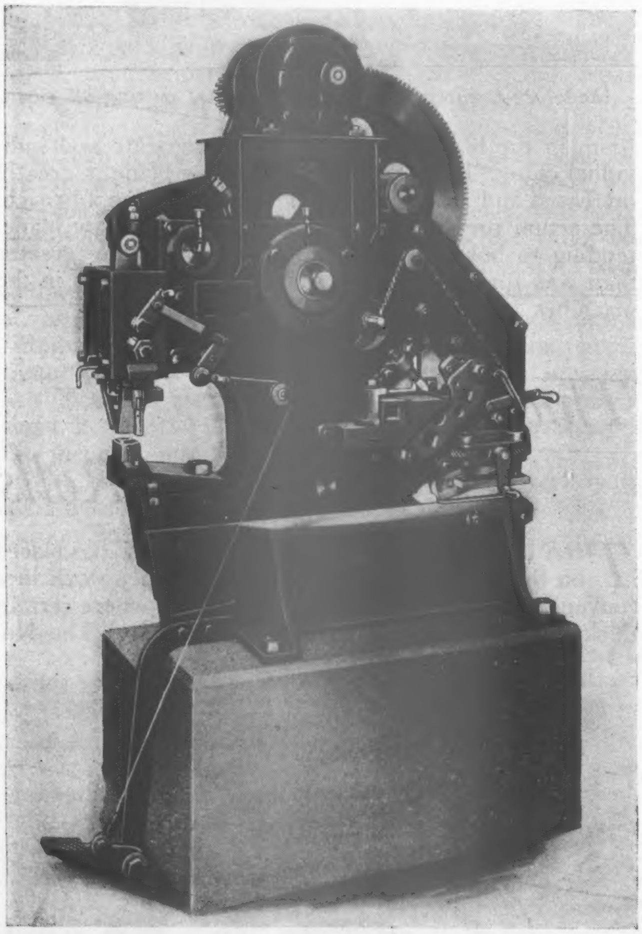
666 Starrett thickness gage stock comes in 25-ft. rolls, ½ in. wide, and in thicknesses from .0015 to .015 in. packed in dirt-protecting metal cases.

The gage stock is spring-tempered to insure accuracy and dependability and marked every 6 in. with a line and the thickness, which allows accurate cutting and eliminates waste. It has the advantage that if the feeler stock becomes bent or kinked from use, the damaged part is quickly cut off and the work continued.

Used in a Starrett thickness holder No. 806, which holds any thickness from .0015 to .025 in. the last bit can be utilized.

A Universal Iron Worker and a Twelve-Inch Drill

TWO developments have recently been completed by the Buffalo Forge Company, Buffalo, N. Y.; namely, its No. 0 universal iron worker and a 12-in. high-speed drill. The universal iron worker, shown in one of the illustrations, was designed to meet the demand



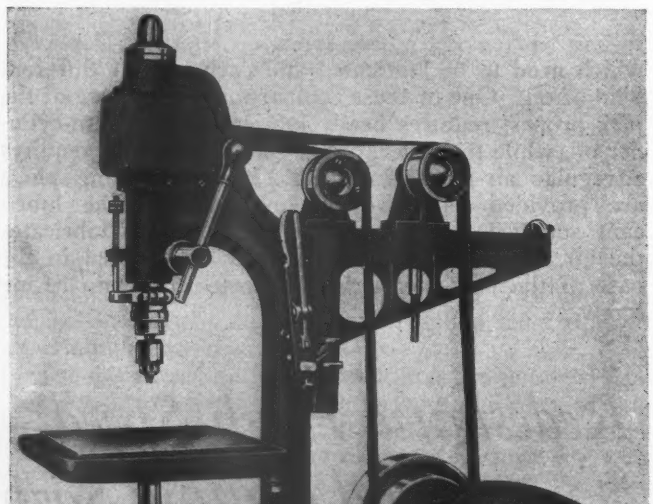
Armor-plate No. 0 universal iron worker

of shops using material of light weight. It has a punch, shear and bar cutter. The frame is of armor-plate steel, the same as used on Buffalo machines of similar design, bolted and dowelled together. The eccentric is a high-carbon steel forging and the flywheel shaft and pinion are nickel steel, with steel gear. The punch throat is of welded construction, designed to make the frame more substantial. The punch is equipped with high and low die blocks. A diagonal plunger permits mitering on a horizontal plane. The shear blades have four cutting edges each, and are interchangeable. No tools are required for adjusting the strippers on the punch or shear.

The machine can punch ⅝-in. holes in ½-in steel plate and ¾-in. holes in plates ⅜ in. in thickness. The throat provides a clearance of 12 in. The shear, with 8-in. knives, can handle ⅜-in. plate and flats 4 in. by ½ in. Special knives can be provided for handling flats 6 in. by ¼ in. The bar cutter can handle 1¼-in. round stock and 1⅛-in. square stock, as well as angles and tees up to 3 in. by $\frac{5}{16}$ in. and 2½ in. by ¼ in. The No. 0 iron worker can be supplied with a built-in notcher if the purchaser desires.

The Buffalo 12-in. high-speed drill is designed for either pulley or motor drive. Four spindle speeds are provided; namely, 3,600, 4,800, 7,200 and 10,000 r.p.m., which can be readily obtained by means of a lever and rapid acting screw. Quick operation of all parts of this machine is provided by quick acting screws, clamps and levers.

All parts subject to normal wear are adjustable. The rack and pinion are self adjusting, which is an improved feature that has been incorporated in this machine to provide the continuous accuracy necessary for high-speed drills. The overall height of the drill is 34 in. and the spindle, which is $\frac{7}{16}$ in. in diameter, has a travel of 3½ in. The maximum height of the spindle

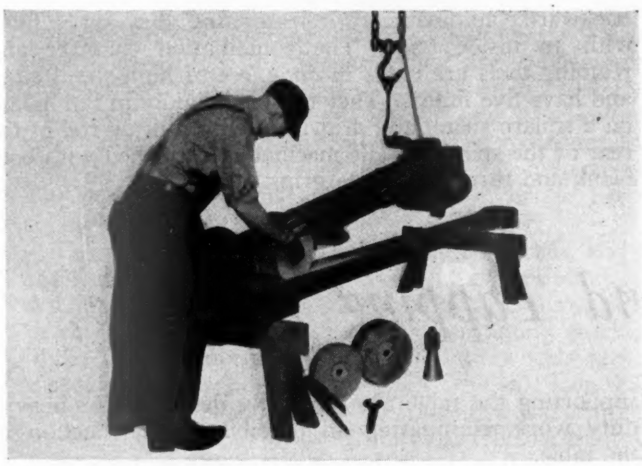


The 12-in. high-speed drill

from the table is 6½ in. The power required to drive this drill is ½ hp. The machine is equipped with a high-speed balance chuck having a capacity up to $\frac{5}{16}$ in., which is the largest size recommended for high speeds.

Locomotive Rod-Polishing Machine

THE Safety Grinding Wheel & Machine Company, Springfield, Ohio, has developed a machine especially designed for polishing locomotive rods. It is of the portable type as shown in the accompanying illustration. Several types of polishing wheels are furnished with the machine for different grinding operations.



This rod-polishing machine may be used on either the top or the side of the work

These wheels are soft-rim cloth wheels on which are glued the proper abrasives for the work intended. The machine is regularly equipped with one 60-grain and one 90-grain wheel, the 60-grain wheel giving a satisfactory finish on coarser work and the 90-grain wheel being used for polishing. The diameters of the polishing wheels are 10 and 12 in. The 10 in.-wheel operates at a peripheral speed of 6,000 ft. per minute.

The equipment includes a ball-bearing buggy and the range of operation of the equipment is limited only by the length of the trolley track. Providing a single track is used it is necessary to spot the work parallel with the track. To remove the necessity of doing this the trolley may be suspended on a jib crane and by swinging the crane and moving the trolley along the crane boom a universal movement is obtained. In this manner several rods may be mounted on raised supports and the operator simply moves from one to the other. A chain hoist is included as part of the equipment to raise and lower the portable grinder, the weight of which is approximately 400 lb.

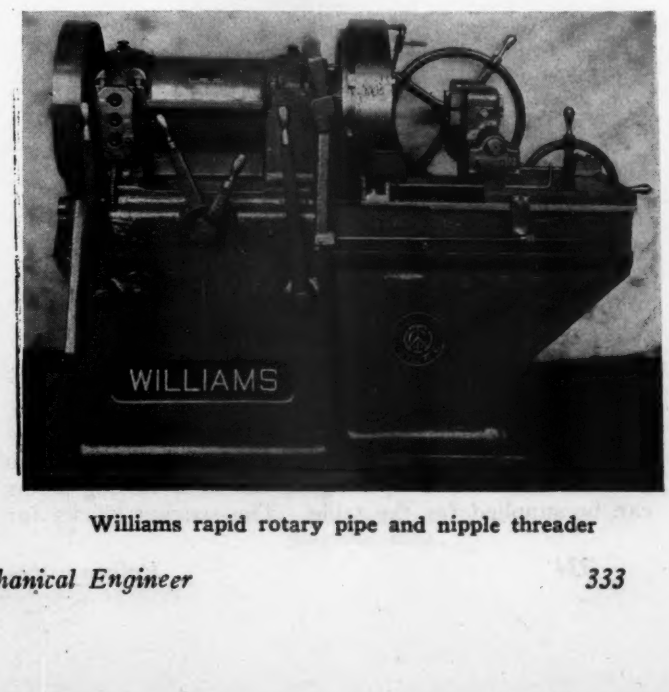
The grinder may be turned over at an angle of 90 deg. either way for grinding along the side of the work if necessary. The equipment is ball-bearing throughout, both on the motor bearings and the grinding-wheel spindle bearings. The drive from the motor to the grinding-wheel spindle is a flat belt. A vee-belt may be used if required but on account of the larger pulleys that are necessarily used with this type of belt, rod channels are not as conveniently ground. A push-button control is located on the hood of the machine on the left side. This operates the automatic starter mounted on the sling of the machine, providing convenient control on the part of the operator. The push button is mounted on the side of the head, rather than the top, so that dirt will not get into the control and cause trouble. The automatic starter is operated on the sling so that it will always be in proper operating position, making it unnecessary to bring the machine back to its normal condition in order to start it or stop it.

Rotary Pipe- and Nipple-Threading Machine

A ROTARY threading machine, which has been designed to meet the requirements of threading pipe and nipples on a low-cost production basis, has been placed on the market by the Williams Tool Corporation, Erie, Pa. This machine is made in two sizes, one with a regular capacity of from 1 in. to 4 in. and an extra capacity of from ½ in. to ¾ in.; and the other with a regular capacity of 1½ in. to 6 in. and an extra capacity of from 1 in. to 1¼ in. These machines have been designated as No. 4 and No. 6, respectively.

A number of distinctive features have been included in the design; such as six changes of spindle speeds, a geared headstock having steel gears running constantly in a bath of oil, internal trip for the automatic die release, external emergency hand trip, self-closing die head, rapid die-changing feature, automatic chamfer and reaming device, a centralized dual control within easy reach of the operator, the motor mounted in the base of the machine with a direct drive through a silent chain and friction clutch.

The bed is made from close-grained gray iron and is constructed with a well-ribbed design of full-box type and with the tie arch cast across the ways section. Particular care has been taken to insure a uniform distribution of material so that the machine will be evenly balanced and braced to withstand exacting service. The headstock is of the selective-gear type, providing six changes of spindle speeds ranging from 16.8 to 89.6 r.p.m. on the No. 4 and 13.3 to 71.1 on the No. 6. Speed changes are con-



Williams rapid rotary pipe and nipple threader

trolled by two levers in front of the machine. All gears in the headstock are made of heat-treated steel running continually in a bath of oil. The spindle is made of cast iron of special analysis, machined and fitted in the headstock. Provisions have been made for keeping the spindle in adjustment for end play. The die head is the Williams "rapiduction" type. The dies are held rigidly in large steel holders with wide bearing surfaces, and the die holders are accurately fitted by spotting and scraping slots in the heads to gage. The holders are gibbed to give additional support and bearing surface. Graduations for setting the die head for the various sizes of pipe are located on the face of the cam ring and convenient to the operator.

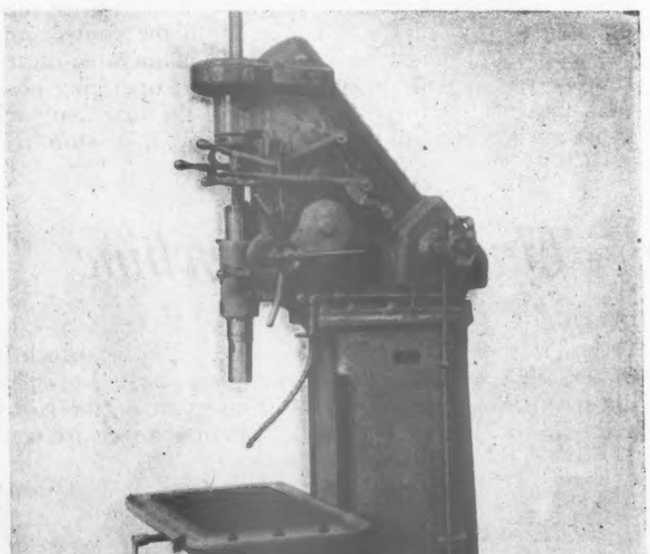
The dies are automatically released by an internal trip made adjustable for the proper length of thread, and are closed by the return of the carriage to the starting position. Adjustment for length of thread is made from the front of the machine by moving the tripping wedge on the reamer attachment. The only tool necessary is a screw driver. The dies are made of high-speed steel, machined and heat-treated. Two sets of dies cover the range. In changing dies, it is not necessary to remove the die holders from the head, as the dies are held in position by a locking clamp with the clamp bolt placed in the front of the holder.

The reaming and chamfering attachment is mounted in the bore of the spindle and can be adjusted to ream and chamfer at the same time the work is being threaded. After the desired length of thread has been cut, the chamfer-reamer holder, which has been forced backward, automatically releases the dies by contact with an inside trip. The combination chamfer and reaming tools are made in one-piece of high-speed steel, and have five flutes. They are held rigidly in the holder on a square shank and drawn up with a draw rod at the rear of the spindle. The machine is furnished with both blank and threaded nipple grips.

Self-Oiling Drilling and Tapping Machine

THE Barnes Drill Company, Rockford, Ill., has redesigned its self-oiling all-geared drilling and tapping machine designated as No. 242. The rigid, massive construction of this machine makes it especially well adapted for railroad-shop use.

In order to minimize the deflection caused by the thrust load developed at the drill, the head is made exceptionally thick from front to rear and is flanged onto a massive column. Spacing blocks or a raising screw can be supplied for the table. The spacing blocks for supporting the table are especially desirable for heavy-duty work, eliminating all possibility of deflection in the table.



Barnes No. 242 self-oiling all-geared drilling and tapping machine

All diagonal transmission shafts, the crown pinion and the crown gear run on Timken tapered roller-bearings, while the drive shaft and cross-feed shaft are mounted on Fafnir radial ball bearings. The spindle thrust is taken on Rollway double-staggered roller bearings.

The spindle and sliding gear shafts have six splines. The spindle sleeve is made of machinery steel with teeth cut integral, and the torque is taken by hardened rollers floating free on the cross spindle. Both the spindle sleeve and the sleeve housing are bronze bushed.

The usual feed box has been eliminated and instead a quick-change geared feed unit is entirely enclosed inside the main frame of the machine. Spur gears are used throughout and eight changes of feed are available, ranging from .0055 to .062-in. per revolution. Slip gears can be supplied to change to higher or lower feeds.

Eight quick changes of geared spindle speeds are also available and are controlled by convenient levers at the front of the machine. Speeds ranging from 64 to 708 r.p.m. are instantly available, and higher speeds may be obtained by running the drive shaft faster than its normal speed of 400 r.p.m. Each spindle is driven through a multiple-disk clutch controlled by a lever on the left side of the column. For tapping operations reversing multiple-disk clutches and gears are added to the drive shaft.

When tapping, a trip can be set so that the instant the tap reaches the depth desired, the spindle will automatically reverse, backing out at increased speed in the ratio of 1¾ to 1.

A geared coolant pump which is mounted on a bracket is driven from the drive shaft of the machine by a clutch which may be engaged or disengaged as desired.

The machine has a capacity for drilling holes 2-in. in diameter in steel. On actual test the machine drives a 2-in. high speed twist drill at 177 revolutions (90 ft.) and .022-in. feed per revolution in steel.

Oliver High-Speed Band Saw

A HIGH-SPEED band saw, which will operate at from 750 to 900 r.p.m., has been placed on the market by the Oliver Machinery Company, Grand Rapids, Mich. The machine is driven with the motor and the lower wheel built on the same shaft, using the unit construction. The motor parts are inserted in a finished circular chamber in the main frame. The motor is connected with a push-button to a magnetic starter mounted on the machine. Both the upper and lower wheels are of the disk type. They are rubber-faced, aluminum-rimmed steel-clad disks (patent applied for). The aluminum rim is demountable and has dove-tail grooves with the rubber tire vulcanized to insure long life and to withstand centrifugal force at high speeds. The demountable rims are easy to interchange for resurfacing with the rubber.

The wheel is safe because there are no spokes, and the absence of windage reduces the power consumption. The machine is equipped with ball bearings throughout. The machine is equipped with external contracting quickstop brake for use in changing saws. Both wheels are encased with steel doors and guards. The cast-iron 36-in. by 36-in. table is tilted by a handwheel, worm and gear. Patent roller guides are used above and below the table. The capacity height under the guide is 22 in. and the swing is 36 in. between the saw and the column of the machine.

The table is ground to reduce the force necessary to push the work past the saw. This, combined with the reduced force necessary because of the increased speed, tends to increase the output.

Two features are especially useful in the pattern shop. The capacity of 22 in. under the guide is unusual and many pattern shops have high patterns which can be cut on the band saw and in many instances will make it unnecessary for the pattern shops to purchase a larger machine. The second feature is the tilting table. The table tilts 45 deg. in one direction and 7 deg. in the other to take care of draft in the pattern.

Band saw with the table tilted and the lower door partly open to show the disk wheel

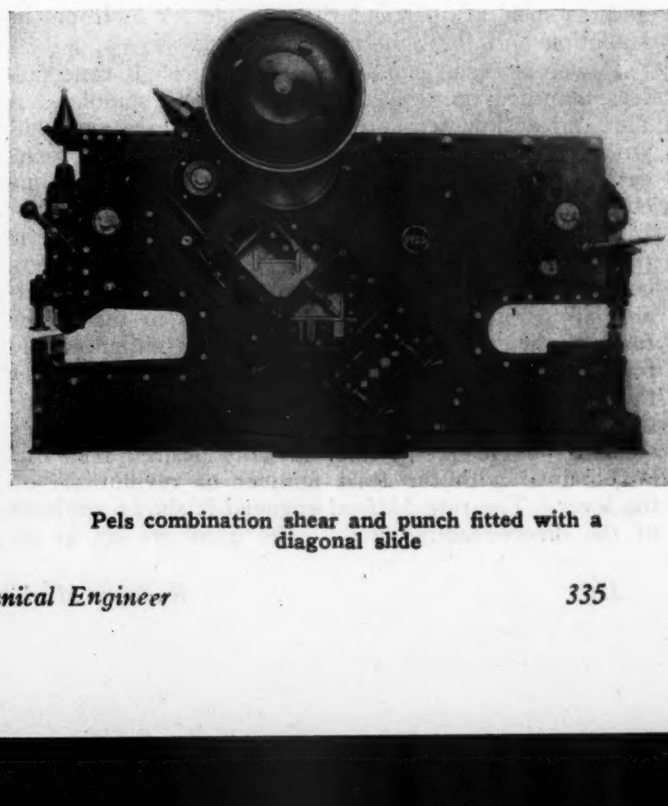
Pels Combination Punches and Shears

HENRY Pels & Company, Inc., 190 West street, New York, has recently redesigned its line of combination punches and shears. Of particular interest to the railroads, because of its capacity, is the universal punch, plate shear, angle, bar, beam and channel cutter shown in the illustration.

The principal feature is that all standard operations of the machine are performed without changing the knives or attachments. In addition, the machine has separate interchangeable knives with which beams, channels, zees and other sections are cut without disturbing the set-up for angles, tees and bars. The simple turning of a knob makes the punch float over the work, stop at any desired point of the stroke, or permits centering by a hand lever. The slide can be raised beyond its highest operating position for applying special tools, etc. The stripper is instantly removable and adjustable without the use of tools.

The plate-shear knives have four cutting edges each and are reversible and interchangeable. The graduated bevel gage can be set for cutting any bevel up to 45 deg. on angles or tees. The diagonal slide permits feeding flat bars, channels, angles and other metal shapes on a horizontal plane for both square and bevel cutting.

The frame consists of two heavy rolled-steel plates of


Pels combination shear and punch fitted with a diagonal slide

special analysis, heat treated and guaranteed not to break. All shafts and other parts subject to heavy stresses are made of forged steel. The gear teeth are machine cut; the pinions are cut from solid steel forgings. Phosphor-bronze bushings are used throughout. The bushings and shafts are precision ground. The flywheel shaft has ring-oiler bearings. The slides travel in wide housings with adjustable gibs.

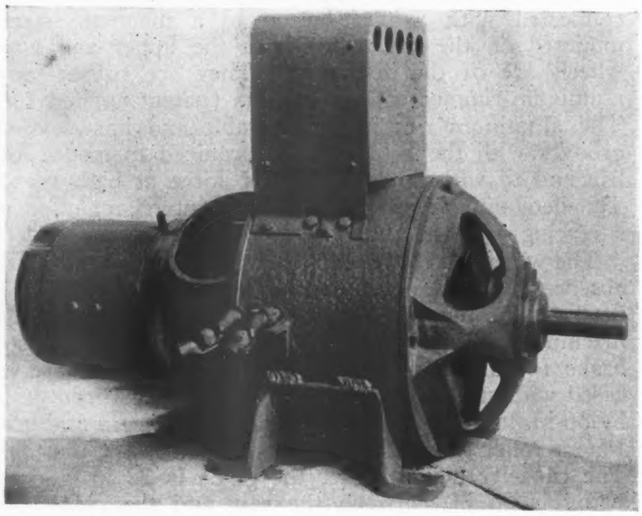
Welding Generator For Dual Service

THE Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently added to its line of arc-welding equipment a new design of 200-ampere generator which is not furnished with a driving unit. This generator is for use in isloated places where electric power is not available and where driving power such as gasoline engines, steam engines, line shafting, tractors, etc., are already at hand.

The complete units consist of a special constant-current type SK welding generator with coupled exciter overhung from the generator bracket, control panel and reactor. The reactor is mounted separately. The overall dimensions of the generator are a minimum so as to permit mounting the generators in the spaces alloted.

The generator is differentially compound wound and designed for a single operator. The constant-current variable-voltage characteristics of the generator, together with the separately excited feature, insures a fast, steady and penetrating arc. Variations in arc length or intensity are automatically compensated for by instantaneous changes in the generator voltage.

The control for the generator is mounted on top of the generator frame and is protected by a sheet metal cabinet. The control consists of a voltmeter, ammeter, and a single-dial field rheostat for adjusting welding current over the entire current range.



Westinghouse welding generator for belted or coupled service

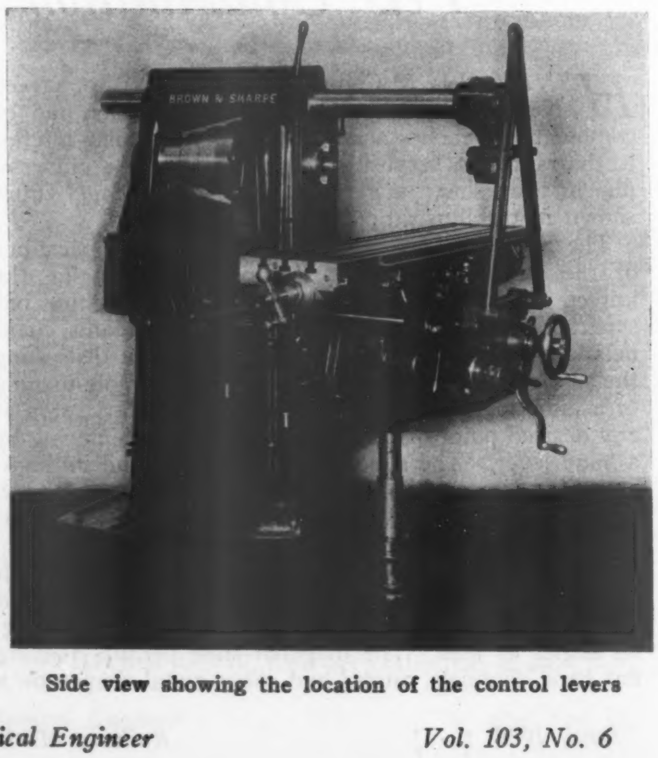
The generator is rated in accordance with N. E. M. A. standards, one hour 50 deg. C. rise on a resistance load at 25 volts. The generator has a welding range from 60 to 250 amperes and requires a driving unit with the following maximum ratings: motor, 10 hp.; lineshaft, 15 hp.; gas engines, 20 hp.

Two Brown & Sharpe Milling Machines

THE Brown & Sharpe Manufacturing Company, Providence, R. I., has recently increased its line of standard milling machines by the addition of the No. 2 standard universal and No. 2 standard plain milling machines. They are of the cone-drive type and, as such, are particularly valuable for toolroom installation and for light manufacturing.

Power is furnished the machines through cone pulleys mounted on sleeves on the machine spindles. A fast and a slow series of spindle speeds are available, with the slow series obtained through the back gears easily engaged by a lever on the left side of the machine.

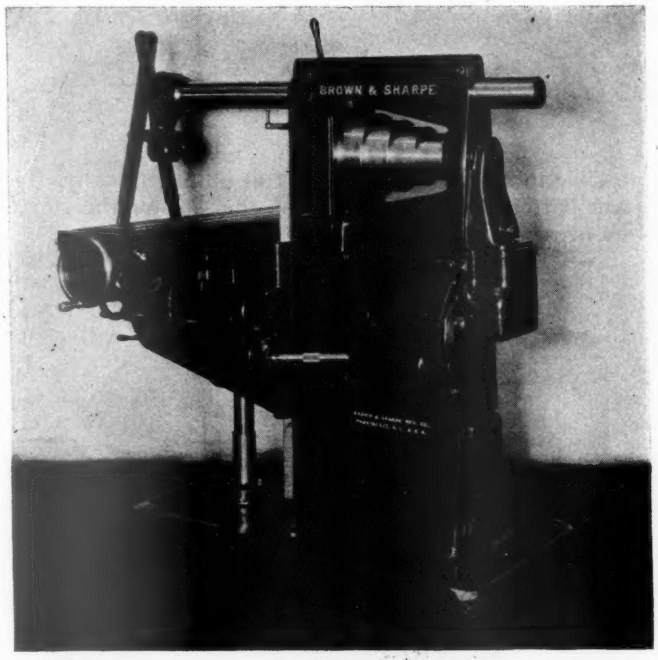
Two operating positions are provided, one at the front and one at the rear of the table, with all levers controlling the operation of the machine readily available from either position. All changes in the power feed of the table are made by rotating either of the feed change levers which are conveniently located at the front and table operating positions. One revolution of either lever, to the right or left, accomplishes a change of feed. In this way any desired feed can be obtained with the least number of revolutions of the lever. The rate of feed engaged is shown on both of the direct-reading dials. The dials are set at an



Side view showing the location of the control levers

angle to facilitate quick reading and are fitted with glass windows to prevent clogging by chips and dirt.

Filtered oil is automatically supplied to all bearings within the column by a plunger pump, thus assuring positive lubrication. A gage on the side of the column



Three-quarter rear view of the Brown & Sharpe No. 2 standard milling machine

indicates the pressure. Another pump automatically lubricates the knee mechanism while a large well at the front of the saddle oils the complete saddle mechanism and the table bearings.

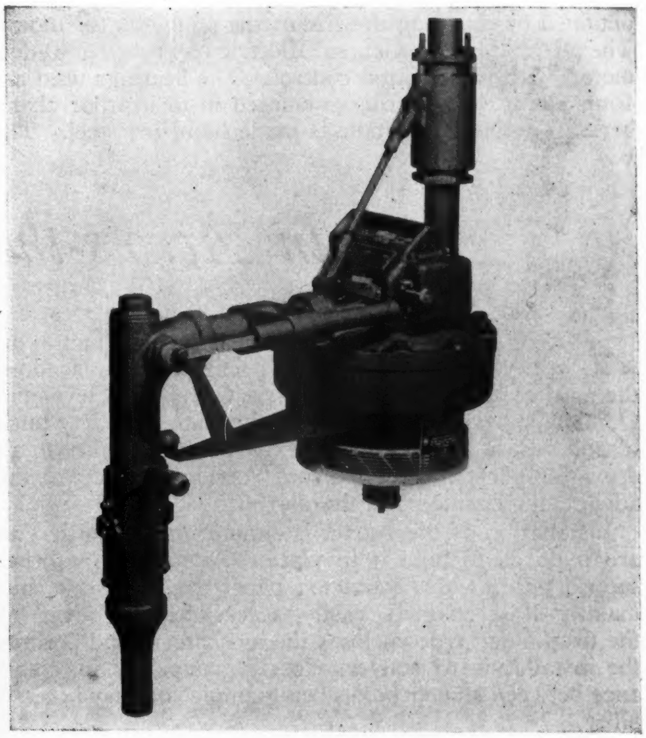
The one-piece knee elevating screw assures accuracy in vertical adjustments. It is completely enclosed in a steel sleeve and does not extend below the base of the machine. The overarm is firmly clamped at two points by a single lever at the front of the column.

Automatic Unit for Barreling Liquids

AN automatic barreling unit designed for use where lubricating, transformer, engine, and cylinder oils and liquids of similar characteristics are being barreled, has just been brought out by S. F. Bowser & Company, Ft. Wayne, Ind.

The device, designated as the Xacto meter barreling unit, is selective and can be set to measure and discharge either one of three different quantities,—30, 50 or 55 gal., with an additional pint when it is desired. When the quantity for which the mechanism has been set is dispensed, the valve in the discharge automatically closes, stopping the flow. An automatic counter maintains an accurate record of the number of containers filled. This counter records to 10,000 and then repeats. It cannot be set back.

The temperature and specific gravity control which can be manipulated by the ordinary workman, compensates for the expansion and contraction of the liquids and insures accurate measurement based on 60 deg. F.

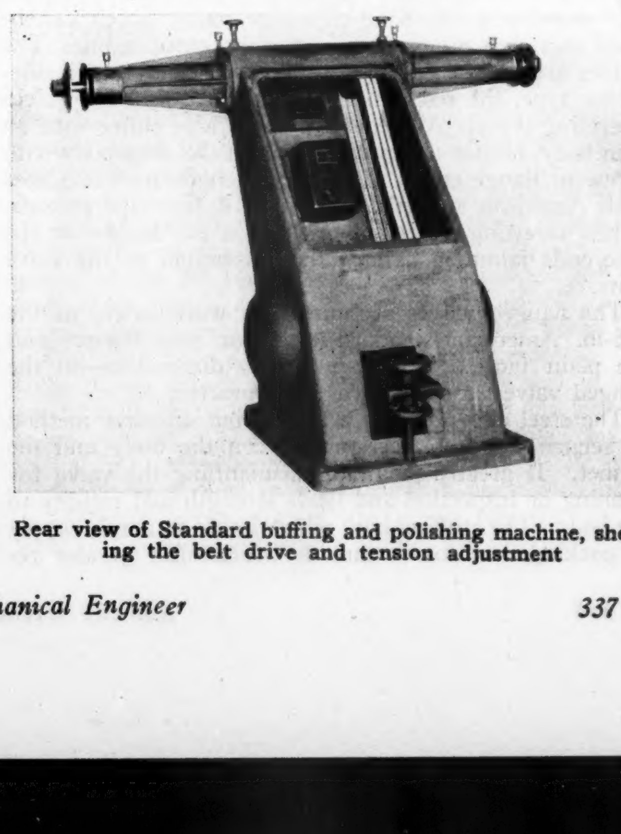


An automatic meter for filling containers with predetermined quantities of oils

The speed of discharge is sufficient so that one operator, with one of these units, can fill approximately fifty 30-gal. containers, thirty-five 50-gal, containers, or thirty 55-gal. containers in an hour.

High-Speed Buffing and Polishing Lathe

SHOWN in the illustration is a buffing and polishing lathe that has recently been placed on the market by the Standard Electrical Tool Company, 1938-46 West Eighth street, Cincinnati, Ohio. This machine is designed for a speed ranging from 2,000 to 3,000 r.p.m., which is



Rear view of Standard buffing and polishing machine, showing the belt drive and tension adjustment

obtained by changing the size of the pulley on the motor. The motor used is a General Electric ball bearing 40-deg. motor, with push-button control. The bearings used are four S.K.F. ball bearings mounted in dust-proof chambers. The buffing spindle is made of nickel steel. The drive is by Dayton vee-cog belts. The motor is set on a hinged bed plate, an adjusting screw being provided so that the operator can adjust the tension on the belts. These machines are manufactured in 3-, 5-, 7½- and 10-hp. sizes.

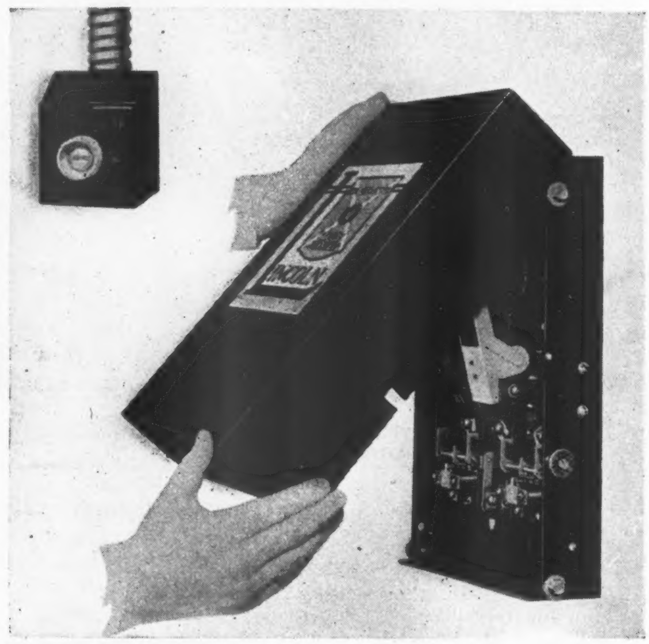
Lincoln Across-the-Line Safety Starter

A REDESIGNED starter which starts a motor directly across the line has been recently placed on the market by the Lincoln Electric Company, Cleveland, O. The starter is controlled by the Lincoln safety push button. Ease of installation, extreme accessibility to all operating parts and rugged construction are some of the advantages claimed for the starter.

Installation of the starter is simple; only four screws are required to hold it in place. Releasing two other screws permits the contactor panel to swing out thus making lead contacts easily accessible. A cover of the drop-hinge type encloses the mechanism and permits the installation of starters closely grouped, 2 in. clearance between starter boxes being ample for easy accessibility.

Long life is assured to the contact points by the wiping action which prevents pitting and by the cadmium-plated steel shields which furnish an instantaneous thermal and magnetic quench for the arcs. The arc chimneys are made of heavy pressed magnesite which shield against currents higher than any to which the starter will ever be subjected. The relay armature has a cushion action for the purpose of reducing wear and insuring long life. Likewise it is provided with replaceable bronze bearings and is actuated by a coiled spring.

The safety push button furnishes an additional safety factor to the starter in that the red stop button encircles and protects the green start button so that it is impossible to close the starting circuit unintentionally. The push button can be mounted on the side of the starter box or arranged for remote control.



Lincoln across-the-line safety starter with push-button safety switch

Lunkenheimer King-Clip Gate Valves

THE Lunkenheimer Company, Cincinnati, Ohio, has developed the King-clip gage valve which can be used on steam, oil, gas, air, water and gasoline lines. The valves are made in three designs; the rising-stem inside-screw type, the outside-screw and yoke and the quick-operating types. All types are procurable either with an iron body, bronze-mounted, or with an all-iron body with screw or flange ends. The thread length accommodates both American standard and A. P. I. line pipe threads. When screwing up a valve, there is no danger of the pipe ends jamming against the diaphragm of the valve seats.

The flanged valves are furnished with flanges of the 125-lb. American standard type for iron flanges and are plain faced. The face-to-face dimensions on the flanged valves are standard trade practice.

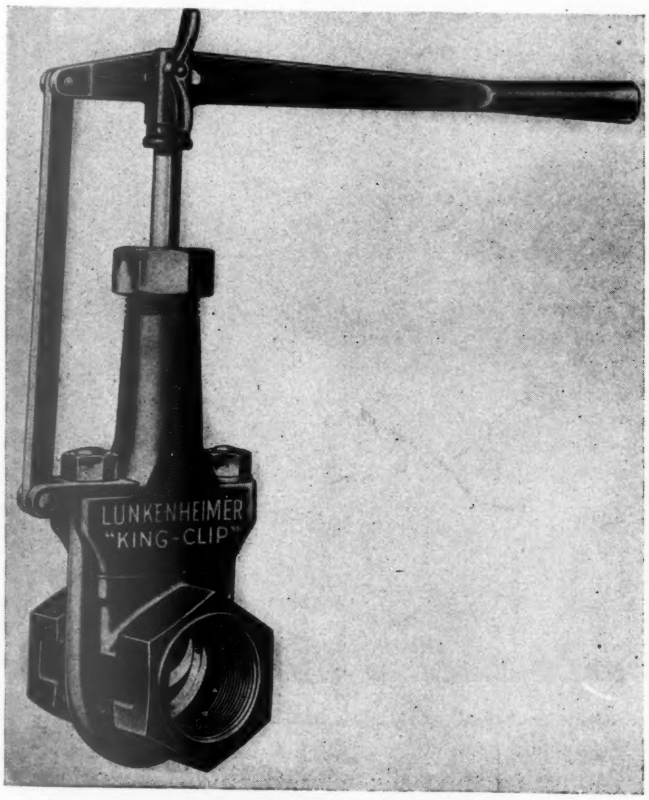
The steel clip provides a simple but effective method of securing the connection between the body and the bonnet. It greatly facilitates dismantling the valve for cleaning or inspection and lends strength and rigidity to the body. The stuffing box, which holds an ample supply of packing, has coarse threads which offer greater resistance to corrosion and insures longer life. A threaded stuffing-box nut with a gland follower is used in valves up to 3 in. inclusive. A bolted gland is used in the 3½-in. and 4-in. valves.

The bronze bushing in the bonnet in the inside-screw and quick-operating iron-body bronze-mounted valves provides a non-corrosive contact with the bronze stem and protects the stem threads and insures easy operation. The outside screw-and-yoke valves, both the bronze-mounted and all-iron types, have a bronze bushing in the top of the yoke.

The stem has a rugged, wear-resisting thread of generous length, which is always in full contact with the thread in the bonnet, with the valve open or closed. The shoulder above the stem thread forms a tight contact with the seat under the stuffing box, permitting repacking the valve under pressure when wide open.

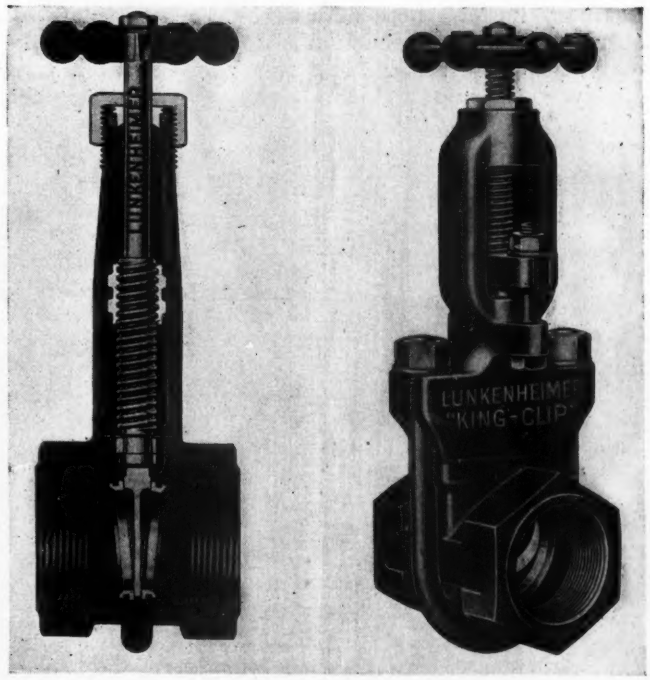
The disc is sharply tapered, making the valve also adaptable for handling heavily impregnated fluids. The disc-stem connection in the bronze-mounted valves is in the form of a horse-shoe band, a construction which imparts extra strength to this part. The seat rings are per-

manently rolled in. The handwheel is held on the stem by a brass locknut. Sizes ¼ in. to 2½ in., inclusive, have a ball handwheel; the larger sizes have a plain rim handwheel.



Sliding stem quick-operating valve

The bronze-mounted valves and the inside-screw patterns, have an iron body and bonnet, and a bronze bonnet bushing, disc, seat rings, stem, stuffing-box nut and gland, and a steel clip. The quick-operating sliding-stem patterns are made of material similar to the inside screw patterns, except that the handwheel is replaced by an iron lever attachment which permits practically instantaneous valve operation. The outside screw-and-yoke



Left—Rising stem inside screw type valve; Right—Rising stem outside screw and yoke valve

valves have an iron body, yoke and gland, and a bronze yoke bushing, disc, seat rings and stem, and a steel clip.

In the all-iron patterns, all parts, except the bronze yoke bushing in the outside screw-and-yoke valves are made of ferrous metals. The all-iron valves are for use in handling solutions which attack bronze, but not iron. Sizes up to 2 in. inclusive have permanently rolled-in steel seat rings; the larger sizes have integral seats.

The pressure ratings of the King-clip gate valves are as follows: Screw ends, ¼ in. to 2 in., inclusive, are designed for 150-lb. working steam pressure, and 225-lb. gas or liquid pressure; screw ends 2½ in. to 4 in. inclusive, and flange ends 1½ to 4 in., inclusive, are designed for 125 lb. working steam pressure, and 175 lb., gas or liquid pressure.

Bridgeport Heavy-Duty Face Grinder

THE heavy-duty face grinder, furnished with a hydraulic table drive, shown in the illustration, is manufactured by the Bridgeport Safety Emery Wheel Company, Inc., Bridgeport, Conn.

The work table operates on large self-oiling ways. All thrust from the grinding wheel is taken against the broad flat side of the rear way. Five tee-slots are provided for holding the work. The hydraulic wheel-feed operates in conjunction with the oilgear pump, producing a positive feed at the end of every table pass. The amount of the feed is predetermined by graduations on a dial. The feed may be cut off either by withdrawing the pawl or by the shut-off valve.

The direction of table travel may be reversed at any time, regardless of the direction in which it may be traveling, by merely depressing a foot treadle. The foot treadle also permits of jumping the working dogs on the table and running out to the safety dogs at the end, thus bringing the table clear of the wheel for loading and unloading.

The oil pump, which drives the work table, is of the variable-delivery reversing type and is piped into a circuit with a reversible oil motor, which drives a short gear train in the bed which, in turn, meshes with the work-table rack. At reversal, the flow of oil in the circuit is changed from one direction to the other.

The machine is driven by three electric motors. The large motor which drives the grinding wheel is connected to it by a silent chain, fully inclosed and running in an oil bath. The coolant pump is directly coupled to another motor and the variable-delivery oil pump is driven by a third motor through a flexible coupling.

Adequate arrangements are made for cooling the work. Two fully adjustable nozzles are provided. The

auxiliary flushing hose may be used where necessary, although its unusual function is washing down the table, magnetic chucks, etc. The reservoir carries a large supply of coolant and which can be readily cleaned. quires infrequent replenishing. The grinding-head lead screw is oil immersed. The main driving chain runs in an oil bath. Whenever necessary, Zerk high-pressure lubrication is arranged.

Heavy-duty face grinder fitted with a 32-in. sectional grinding wheel

Careful attention has been given to lubrication. All of the table driving gears and the table rack are splash lubricated. The spindle bearings have a large reservoir in conjunction with a circulating oil system which requires infrequent replenishing.

A complete set of alining shoes is regularly furnished, which greatly facilitates obtaining proper alinement in setting up the machine and makes it comparatively easy to maintain.

Elwell-Parker Dumping Platform Truck

THE Elwell-Parker Electric Company, Cleveland, Ohio, has designed a lift truck that will travel over the floor and elevate or tilt the platform, one unit operating at a time or all at the same time, each action being entirely independent of the other two.

When the platform is level the tructor has the same characteristics and uses as a standard machine, but if material is to be handled which can be dumped, it is only necessary to pick up an open-nosed box skid without using any more care than is used with standard flat skids. This is accomplished because the platform nose casting is provided with a special notch in the end which prevents the dumping skid from sliding off but has no holding effect on any other skid.

Materials may be handled by this machine directly from the receiving dock, carried to the store room and poured into the stock bins, on to inspection benches or tables or into hoppers or containers; scrap may be collected in dump skids and can be handled directly from the point of accumulation to the pile with no other labor than that supplied by the machine and the man who is operating it.

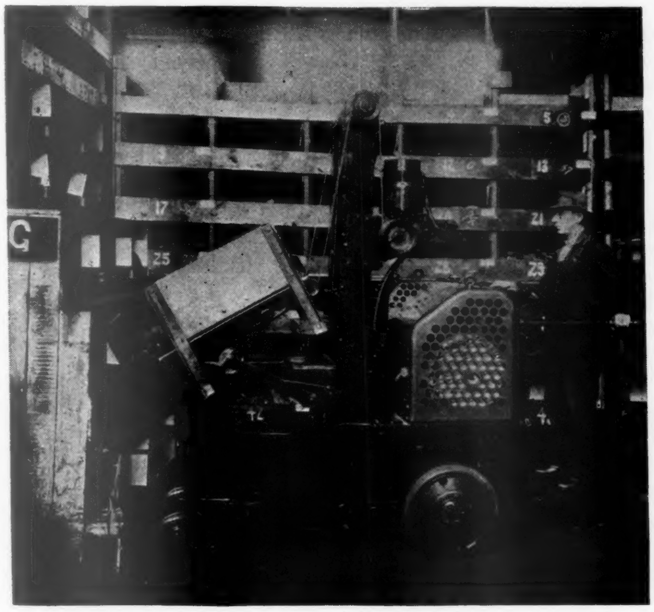
All of the controls for starting and stopping the truck, and elevating and tilting the platform, are located on the operator's dash and all movements of the machine are controlled by the operator without stepping from the operating pedals. The usual Elwell-Parker safety features are included in this new machine, the platform travel being limited by automatic cutouts at the maximum and minimum points of elevation. The dumping action is also limited automatically at its maximum angle. The travel control, with the independent power and brake action, together with the fact that all levers are self-returning to the off position, makes the machine practically fool proof.

No overload cutouts are used on the motors as the extra heavy overload motors are capable of withstanding high surges of current which occur under unusual conditions of lift and travel such as running heavy loads over uneven floors, negotiating ramps and similar work pertaining to handling material.

The tilting action is designed on the same principles as all Elwell-Parker high lift machines, that is, the platform is tilted by the use of winding drums and cables, in place of chains, screws or racks. The platform is hinged at the tip of the platform carriage arms and rests on stops that are located close to the elevator uprights.

On both sides of the truck platform at the extreme end away from the pivot pin are located the levers for raising the platform on end to tilt it. One of each pair of levers is fastened to the elevator carriage and the

other to the platform, and each pair is hinged in the center, all joints being flexible. The cables are dead-ended at the base of the uprights and pass over sheaves at three points on the lever arms, thence over sheaves at the top of the uprights and down to the winding



A special design of electric truck for dumping parts onto a bench or into bins

drums.

The action of raising the platform is accomplished by winding in the cables, pulling in on the tip of the vee-point of the pivoted lever which spreads the arms and drives the platform upward.

Simonds Inserted-Tooth Saws

INSERTED-TOOTH metal-cutting saws of a new design are being placed on the market by the Simonds Saw & Steel Company, Fitchburg, Mass., under the Red Streak trade name of the company. The inserted teeth are made of high-speed steel and are designed to permit high cutting speeds. Every alternate tooth is rounded on the top and is slightly higher than the other alternate teeth. These round-top teeth engage the work first and cut a groove. The square-top teeth follow through, cleaning out the corners of the cut and breaking the chips into three pieces. Curved gullets of a new type eliminate any danger of the chips becoming welded to the teeth, thus causing possible damage to either the saw or machine.

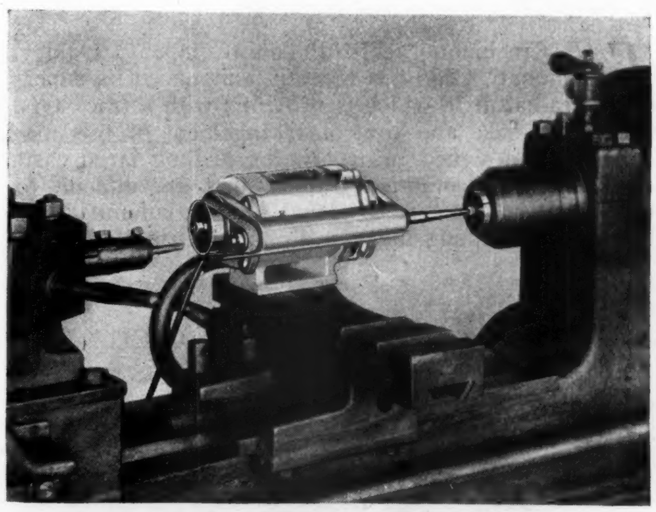
Through the use of high-speed steel teeth, much greater cutting speeds, feeds and depths of cut can be taken than is possible with solid-tooth carbon-steel saws. The body of the new saw is made of a tough alloy steel that will stand up under heavy feeds. The saws cut a kerf as narrow as that produced by the usual solid saws. It is not necessary to remove the inserted teeth for sharpening. When worn out, they can be easily replaced. Seven sizes of teeth are made for saws from 6 to 72 in. in diameter. Larger saws can be made to specifications.

Tool-Post Grinder

THE Luther Grinder Manufacturing Company, Milwaukee, Wis., has placed on the market a booster-driven tool-post grinder, which can be used to grind milling cutters, lathe centers, vee blocks, etc. The motor frame and mounting are made in one piece for the pur-

Luther tool-post grinder

pose of assuring rigidity and chatterless work. The adjustable spindle head can be raised or lowered through a 3-in. arc. The ⅞-in. spindle shaft is made of special steel, ground to size. It is fitted in with long bearings and



Luther Maxi-Motor grinding a spring collet on a hand-screw machine

tow sets of double-row ball races to eliminate vibration.

The ¼-hp., 110-volt, universal motor is air cooled by a specially constructed fan. The air is filtered before it passes into the motor. The control switch is placed in front of the operator.

The unit is furnished complete in a special carrying case with a 4-in. grinding wheel for external work and a 1-in., ½-in. and a ¼-in. wheel with extension spindles for internal work. The net weight is 15 lb.

Workace Radial Wood Saw

THE radial woodworking saw, recently placed on the market by J. D. Wallace & Company, 134 South California avenue, Chicago, includes in its design several unique and useful features. The machine is portable and can be shifted to suit the location of the work. It derives its power from the ordinary lighting circuit or the power circuit, direct current or alternating current of 25, 30, 40, 50 or 60 cycles.

Its operation is not confined to straight cut-off work. The saw is easily adjusted to cut at any angle for cross cutting or ripping, dadoing or grooving, rabbeting, routing, panel raising, shaping, sanding, etc.

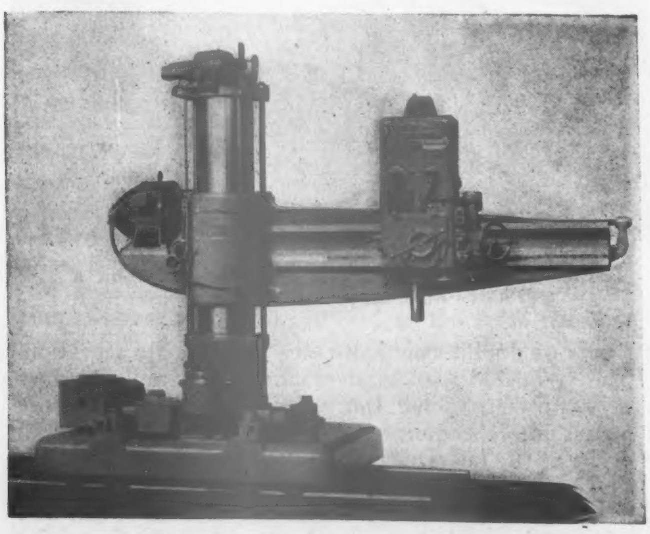
The saw works from above. The motor is built in and directly connected. The saw and motor unit are mounted on a turn table 6 in. in diameter, which in turn is mounted on two heavy steel rods placed 5 in. apart to prevent springing. The rods are mounted in a radial arm.

The radial arm is mounted in the pedestal on a turntable 10 in. in diameter, permitting the arm to be set in any position. The pedestal is also mounted on a turntable, 10 in. in diameter. By these three turntables the machine is readily placed in position for any kind of cutting. With an 8-in. blade it cuts 2½ in. deep; with a 9-in. blade it cuts 3 in. deep. The saw travels 19½ in. in the arm and is adjustable vertically 5¾ in. The motor which is fitted with ball bearings is the General Electric universal type. Speed reduction is effected through gears. The saw bearings are made of bronze and are automatically supplied with force-feed lubrication.

The Workace radial saw will cut in any position

A Radial Drill for Large Castings

THE Cincinnati-Bickford Tool Company, Oakley, Cincinnati, Ohio has recently announced its super-service radial drill, which is provided with a track-type base. The base and control arrangement of this machine were designed primarily for drilling large castings, such as locomotive frames, that are difficult to handle. It has an 8-ft. arm and a 19-in. column. The drill is moved along the base by an electric motor and is secured for drilling by rail clamps, actuated by a vertical torque motor. Both the traversing motor and the rail-clamping motor are controlled at the drill spindle.



Cincinnati-Bickford radial drill mounted on a track-type base for drilling locomotive frames

The column of the machine is clamped by the torque motor which is mounted on the top of the column. This motor is also controlled from the head so that the operator may bring the machine to position on the rails, swing the arm and clamp rigidly without leaving his position at the spindle. Thirty-six spindle speeds and 18 rates of feed are also controlled at the head, which eliminates unnecessary walking on the part of the operator.

With the exception of the track type base, and control, the features of design incorporated into this machine are the same as those described in the October, 1926, issue of the *Railway Mechanical Engineer*, page 638.

VALVE RESEATING MACHINES.—The eight-page folder of the Leavitt Machine Company, Orange, Mass., illustrates and briefly describes the Dexter valve reseating machine for railway service.

PROTECTIVE COATINGS.—The Quigley Furnace Specialties Company, 26 Cortlandt street, New York, describes in a 24-page illustrated booklet Quigley Triple A solutions for protecting iron, steel, galvanized and plated surfaces from corrosion, also for waterproofing and protecting the surfaces of concrete, stone, brick, plaster, cork, wood, etc.

Wallace Pipe Bender

THE illustration shows a motor-driven pipe bender, manufactured by the Wallace Supplies Manufacturing Company, 1312 Diversey Parkway, Chicago, which can be equipped for bending tubes, conduits, reinforcement bars, angles, ties, channels and special sections. The speed of the machine when driven by a 7½-hp. motor, is 2 r.p.m. under direct drive through the worm gear and 1¼ r.p.m. when operating through the back gears. A moveable block on the worm gear serves to stop the machine for any desired number of degrees of bend.

The machine can be put in action forward or reverse, and can also be stopped at any point by a lever at the front of the unit which operates the clutch fingers of the double cone-clutch mechanism.

Lubrication is effected by oil tubes leading to all important bearings. The worm and worm gear run in grease.

The standard bending forms furnished with the machine are as follows:

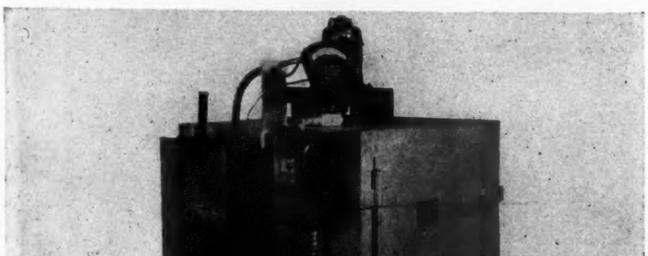
Size of iron pipe	Radius	Degree of bend
1¼ in.	7 in.	90
1½ in.	9 in.	90
2 in.	12 in.	90
2½ in.	15 in.	90

Wallace No. 6-C motor driven pipe bender

Fan Included in Electric Air Drawing Oven

THE General Electric Company, Schenectady, N. Y., has developed an air drawing oven, Type AD, for drawing carbon steel at temperatures up to 750 deg. F. In this oven, it is claimed that quality is improved and production is increased as the result of the use of a fan for agitating the air around the work.

Any temperature up to 750 deg. F. can be obtained in the oven, thus covering the full range of temperatures required for drawing and bluing carbon steel. Only .9 kilowatts is required to maintain a temperature of 500 deg. F. in the oven. Where the oven is in daily use, but 25 min. are required to reach a temperature of 500 deg. F. in the morning. By installing a time switch, however, the oven can be brought up automatically to temperature before the workmen arrive, and can be cut off automatically at closing time.



Air tempering oven furnished with a motor-driven fan and a temperature-control instrument

The fan is located in the heating chamber and is driven by a vertical motor mounted on top of the oven.

The oven is of double-wall construction throughout with the intervening space of 4-in. filled with heat-insulating material. The steel sheets which form the walls are electrically welded together and re-enforced by angles welded along the corners and extended downward to form the legs. The heating chamber is closed by a well-insulated and closely fitted door. A strip steel grate for supporting the work forms the hearth, which is level with the inner edge of the door opening.

One sheath-wire heating unit is located at the top of the heating chamber, and a second is placed just under the hearth. Both windings are so distributed as to obtain uniform heating over the hearth. The unit terminals are brought through the back wall to a connection box and are wired to the enclosed control panel.

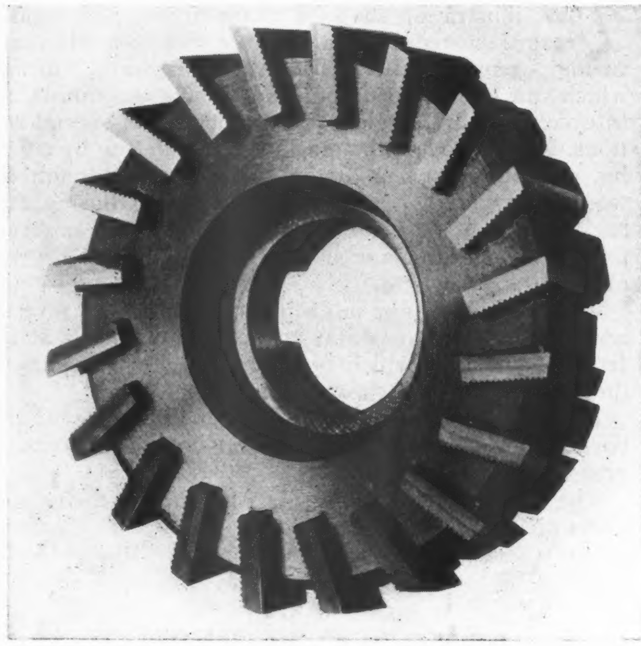
Temperature control is fully automatic, consisting of an enclosed contactor panel and a controller. The controller can be set at any point up to 750 deg. F. and will hold the oven at a uniform temperature within a margin of five degrees without further attention on the part of the workman. The heat-sensitive device located in the oven chamber governs the operation of the controller, and the latter actuates the contactor through a relay, opening or closing the unit circuit as the temperature of the oven tends to rise above or to fall below the setting. A recorder controller may be used with the oven for obtaining a continuous temperature record.

Inserted-Blade Milling Cutters

THE Goddard & Goddard Company, Detroit, Mich., is now introducing a new and practically complete line of inserted blade cutters. The line includes small facing cutters (shell end mills, etc.) from 2 in. diameter to 7 in. diameter, the range from 3 in. diameter to 7 in. diameter being applicable to the new national standard shell end-mill arbor; right and left-hand spiral facing cutters adaptable to milling-machine spindle noses; right and left-hand spiral straddle mills from 4 in. diameter to 20 in. diameter; alternate-tooth cutters from 4 in. diameter to 8 in. diameter, and in a width range from ½ in. to 1 in. Only seven sizes of blades are required for the maintenance of the entire line so far developed. At an early date, the range of the line will be continued into heavier types suitable for extreme stock removal.

The cutters are fitted with inserted blades having machined serrations on the backs which meet with corresponding serrations in the back of the body tooth slot, when they are in place. This design obviates any possibility of the blade tipping in service; neither can it slip radially owing to the fact that the design of the serrations more than doubles the frictional contact area, in the back of the tooth, and this is further enhanced by a flat wedge used in front of the blade, the area of which is approximately the whole of that available on the tooth. Accuracy of workmanship and the use of seizing angles in the design of the wedge eliminates the necessity of further accessories in the design, to keep the wedge seated.

The serrations which run longitudinally are spaced on a 1/16 in. pitch, so that the blade, as peripheral chip clearance necessitates, may be projected radially in multiples of that unit. They may be moved out longitudinally as face chip clearance decreases and in any desired amount.



The blades in the Goddard & Goddard cutter are held in place by serrations which mesh with those in the body of the tool

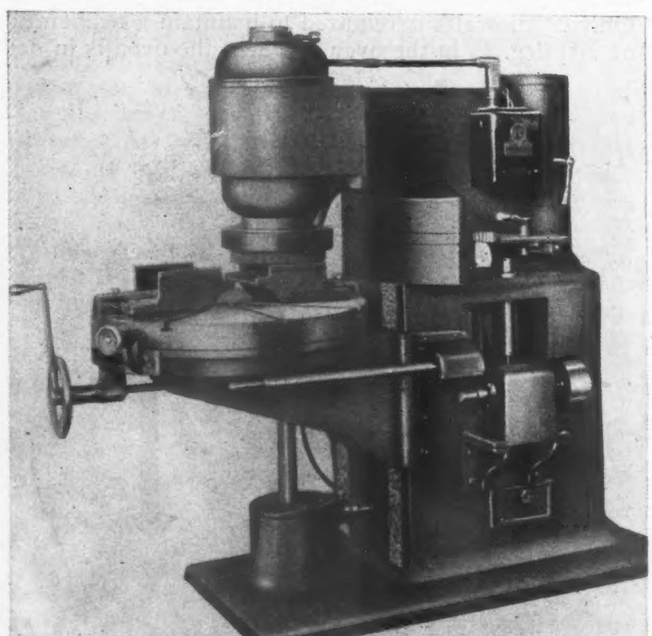
Vertical Production Surface Grinder

THE illustration shows a vertical surface grinder designed by the Covel-Hanchett Company, Big Rapids, Mich., for grinding hardened steel dies, gages, tools, chasers, etc. The base is made in one casting and is of box construction, heavily ribbed, forming a rigid support. The base also serves for carrying the necessary adjusting screws, clutches, levers, gears, bearings, etc., for the power-operated table and arm.

The wheel arm is of box or rectangular construction and is bored at one end for Timken roller bearings and mounted on a heavy stud or vertical shaft which insures a free oscillation of the wheel eliminating any tendency of vibration and chattering of the wheel head. A segment and rollers are provided near the wheel for carrying the arm to insure ease of movement and rigidity, and to prevent any tendency of vibration or inaccuracy.

The spindle and armature shaft is made of forged carbon steel, which is mounted in deep-groove ball bearings and runs in a drawn-shell motor housing. No clamps are used for holding the wheel on the spindle mounting.

The grinding wheel is surrounded by a heavy guard securely held to the wheel head. The guard is adjustable and furnishes adequate protection in the event of the wheel breaking.



Hanchett vertical surface grinder fitted with a 12-in. wheel

The work to be ground is held either on a magnetic chuck, by clamping or by its own weight. A heavy knee is supported on the front of the bed with wide-spread ways to insure the maximum amount of rigidity. Tables of suitable design are mounted on this knee, depending upon the conditions to be met. In some cases, a rectangular table with a magnetic chuck best serves the purpose; in other cases, a circular indexing table is more suitable, while other cases require a revolving table operated by power.

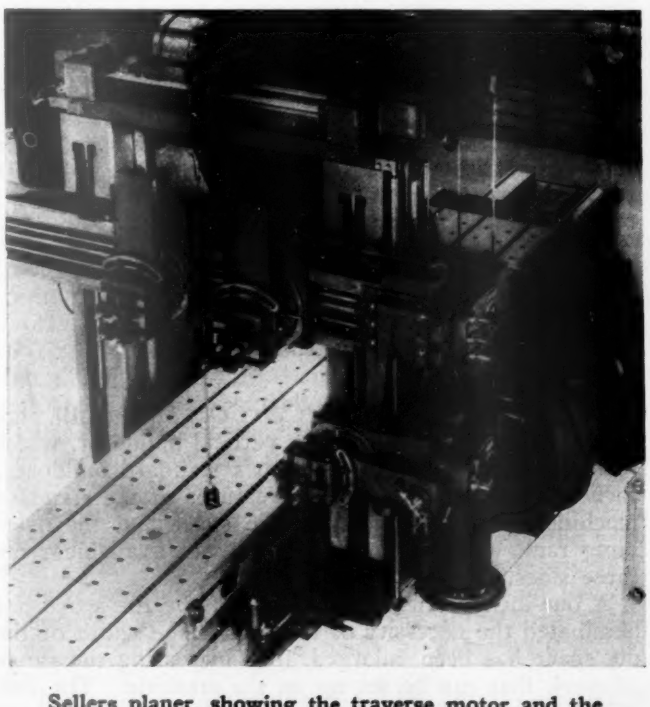
All moving parts, ways, bearings, etc., are furnished with oil cups and means of lubrication and are well guarded from water, dust and grit.

The machine, shown in the illustration. is driven with a 5-hp., 1,800-r. p. m. motor. It may be furnished with a 10-in., 12-in. or 14-in. segmental or cup wheel. The circular table speed can be furnished from 5 to 35 r. p. m. to meet the user's needs. The arm swings on a 30-in. radius. The machine requires a floor space of 34 in. by 50 in.

Sellers Planer with Spiral-Gear Drive

WILLIAM SELLERS & CO., INC., Philadelphia, Pa., has placed on the market a series of planers of new sizes, ranging from 3 ft. to 16 ft. Incorporated in these planers is the spiral-gear drive, which has been common to all Sellers' planers for the past eight years. Among other features are the extended-back cross rail, which is locked from one point, and the independent rapid traverse by the use of which the electric feed need not be disengaged before traversing. The traverse motor is also used for adjusting the cross rail.

A removable channel is placed between the ways in the middle of which is placed an oil strainer. The oil also passes through a Purolator before it is forced by a motor-driven oil pump through the lubricating system. The main motor drives a herringbone gear and pinion. Power for the cross-rail feed is furnished by an electric motor.

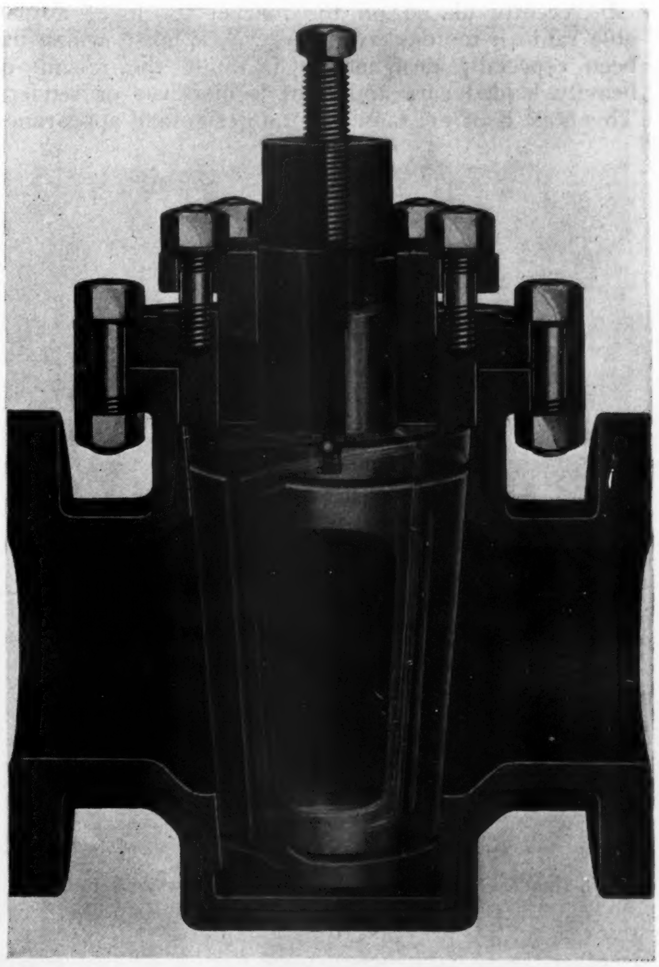


Sellers planer, showing the traverse motor and the table-drive motor

Plug Valves for 150 lb. Pressure

THE Barco Manufacturing Company, Chicago, has placed on the market a 150-lb. lubricated plug valve to supplement the 250-lb. plug valve already manufactured by this company and previously described in the pages of this magazine. The valve can be furnished in all sizes ranging from ½ in. to 8 in.

The difference between the LCI, 150-lb valve and the AGI, 250-lb. valve is as follows: The LCI valve is fitted with a double gland allowing a mechanical means of keeping the plug seated with the proper pressure against the body, eliminating the necessity of having the body casting open at both ends and allowing the valve to be applied with either end used as an inlet. On the higher pressure valves, the plug is inverted, necessitating a cap on the lower part of the body. The plug is kept seated by a balancing arrangement of the fluid



Cross-sectional view of the Barco Type LCI 150-lb. pressure lubricated plug valve

pressure, which keep the plug securely in the body and this in turn is relieved from being too tight by the gland and packing at the small end.

The plug in this valve is lubricated on the entire surface and the opening and closing sweeps the seat clean of any foreign matter so that the seats are not damaged by scale and other foreign substance lodging on them. The body is closed at the small end of the plug and open at the large end, but is provided with an auxiliary gland so that the valve may be repacked by removing the smaller gland and packing and replacing the packing without any danger of the plug blowing out.

Screw-Jack with Air-Motor Drive

THE Joyce-Cridland Company, Dayton, Ohio, has recently placed on the market its Joyce adjustable ram air-motor-driven screw-jack hoist, which has been especially designed to facilitate the raising of heavily loaded cars and light locomotives or tenders. This hoist is of the same general design and appearance

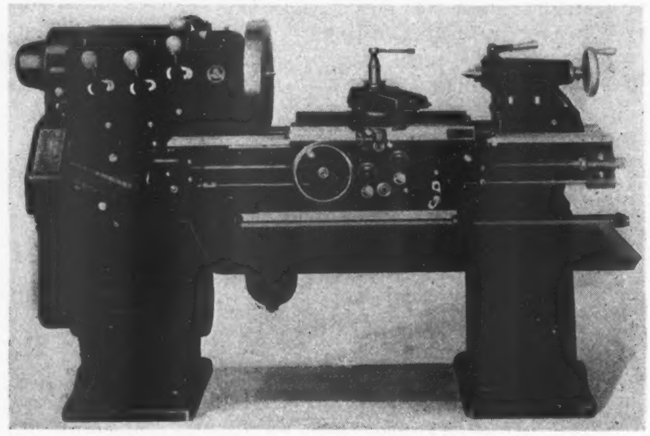
Adjustable ram air-motor-driven screw-jack hoist designed for heavy lifting

as other Joyce jack hoists used for locomotive coach and freight car department service. The new hoist is equipped with an adjustable hand-operated screw, which has a rise of 12 in. This feature enables the jack to be used in locations where the floor is not on a level with the tracks and thus avoids blocking.

The adjustable ram hoists operate in exactly the same manner as their predecessors in the Joyce line. One man controls the lifting of the load by a pair of hoists from a Y-valve. Automatic shut-offs at both the upper and lower limits of the ram eliminate the need for constant attention while the hoists are lifting. The jack is equipped with a heavy-duty air motor.

Monarch Line of High-Speed Lathes

THE Monarch Machine Tool Company, Sydney, Ohio, has developed a new line of lathes in sizes from a 14-in. swing to a 36-in. swing and providing maximum spindle speeds of from 600 to 1,500 r.p.m.



High-speed lathe designed for operation with tungsten-carbide cutting tools

This new line of lathes was designed to meet the demand for a machine that would obtain the best results with the new tungsten-carbide cutting tools such as Widia, Carboloy and others now appearing on the market which are being used in production work. Although these lathes are designed especially for high-speed work, the new lathes may be operated at the lower speeds when cutting tools of ordinary high-sped steel are used.

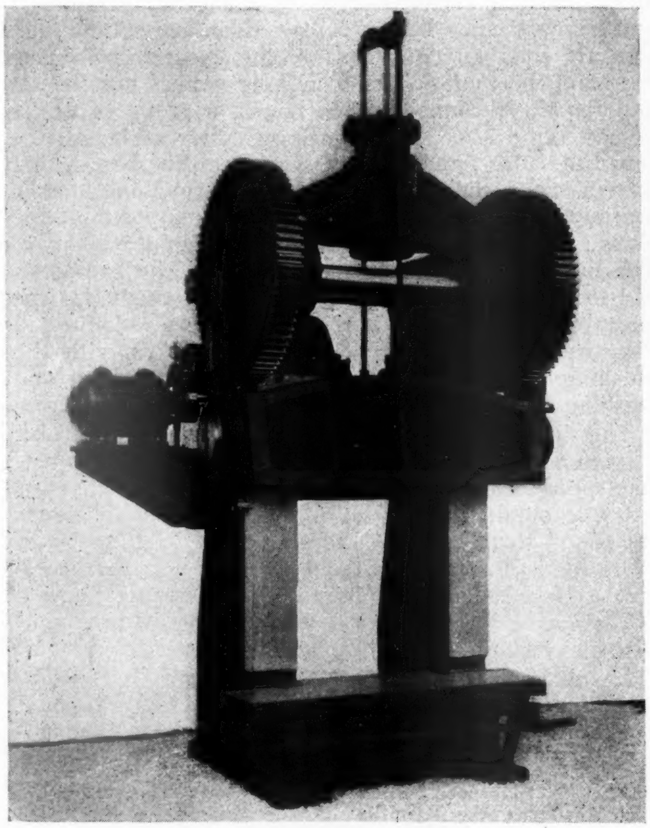
The new Monarch lathes are designed with the helical-gear head-stock, and has Timken bearings throughout to secure quiet and smooth operation of the machine. These lathes are designed to transmit sufficient power for the utilization of tungsten-carbide cutting tools. This feature is essential, due to the fact that a greater amount of metal is removed from the work in a given time with the new cutting tools than can possibly be accomplished with the high-speed steel tools. Cast iron, for example, is turned at from 500 to 700 surface cutting feet per minute and other materials at corresponding speeds.

Vertical Bulldozer

WILLIAMS, WHITE & CO., Moline, Ill., has placed on the market a vertical bulldozer, which in reality is one of the company's standard bulldozers turned on end. It retains the features of the standard machine of long stroke, long die space and the overhung ram, which makes the die space available from three sides.

A one-inch vertical adjustment of the die space has eliminated the necessity of tail lugs. The width of the die space has been enlarged, thus increasing the range of work that can be set up on the machine. The machine is made single or double-geared to operate at

from 10 to 30 strokes per minute. It can be furnished with a two-speed drive to operate at 10 and 20 strokes per minute. The machine can also be furnished with a hand clutch control or with a treadle control, with



Front view of the Williams vertical bulldozer

an automatic stop at the top of the stroke. It is made in the Nos. 53 and 54 sizes which have capacities of 50 and 85 tons, respectively.

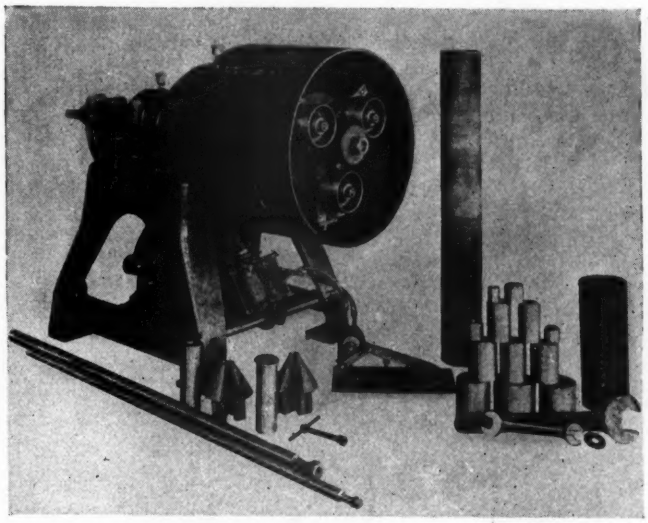
A Flue Roller for Safe Ends

JOSEPH T. RYERSON & SON, INC., Chicago, has placed on the market a flue roller which has been developed to make safe ends and to do reclaiming work of any length.

The rolls rotate about the flue in the usual manner, but the rolling-down action is done by an air cylinder actuated by a foot-controlled air valve. The advantages claimed for this method of control are that it is easier for the operator and that the labor required to roll a flue is greatly reduced.

The machine can be used on any size flue or tube from the smallest to the largest by changing the mandrel. This operation is simple. It is only necessary to remove one nut, slip off the mandrel, put on the size required and tighten the nut. The adjustment of the rolls for different sizes is made by turning an adjustment screw.

The machine operates with a 3-hp. motor on standard flues and a 5-hp. motor if used for 6-in. superheater tubes.



Ryerson flue roller for making safe ends and reclaiming work of any length

Air Blower with a Lever Handle

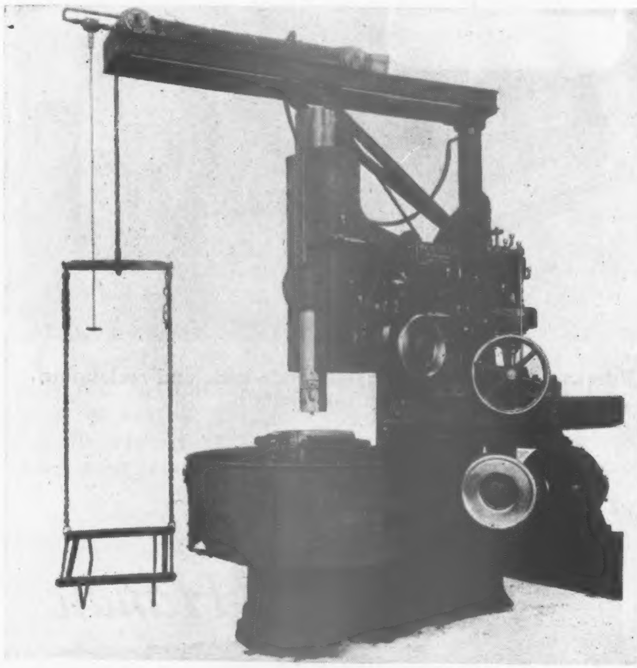
JENKINS Brothers, 80 White street, N. Y., has replaced the button type of control valve common to the previous type of its air gun blower with a curved

The curved handle adds to the ease of operating the Jenkins air gun

handle as shown in the illustration. The device is also fitted with a Jenkins disc of resilient composition, which always makes a tight contact when the valve is closed. When the valve is open, the head of the spindle seats tightly against the neck of the body, which prevents the escape of air around the spindle.

Changes in Driving-Box Boring Machine

RECENT changes made in the driving-box boring and facing machine, manufactured by William Sellers & Co., Inc., Philadelphia, Pa., include a new design of bar, in improved table drive giving higher speeds, a centralized oiling system, and a power traverse for the boring and facing slides.



Sellers redesigned driving-box boring and facing machine

The bar is now made with two roughing cutters adjusted by a micrometer with set screws for locking. A single finishing cutter is set at right angles to the others and below them. The principal advantages of this design are simplicity and convenience in setting the cutters, and the fact that the roughing cutters may be set and remain unchanged when boring a group of boxes of the same size. The finishing cutter is below the roughing cutter, and may be drawn into the bar so that it will clear the work. After the roughing cut is finished, the bar is returned to the top position, the finishing cutter is set out and the finishing cut run down. The finishing cutter is then drawn into the bar again and the bar run to the top of the stroke, ready for the next box. When counterbores are required for oil clearances, the necessary cuts may be taken with the finishing cutter. Micrometers for both roughing and finishing are reached from the operating position.

The drive is arranged with gear changes to furnish a greater range of speed. With a direct-current adjustable-speed motor it is possible, with one change of gears, to obtain from 15 to 80 r.p.m. The high speeds are found to be more advantageous in finishing boxes while the low speeds are required wherever it is necessary to face steel boxes before the liners are poured. The change of speed may be easily and quickly accomplished by sliding the hardened steel gears by a lever.

An oil tank at the rear of the machine feeds oil to all of the driving-gear bearings, the table and the spindle. A series of tubes with sight-feed glasses and adjustable valves runs from the tank of the various bearings.

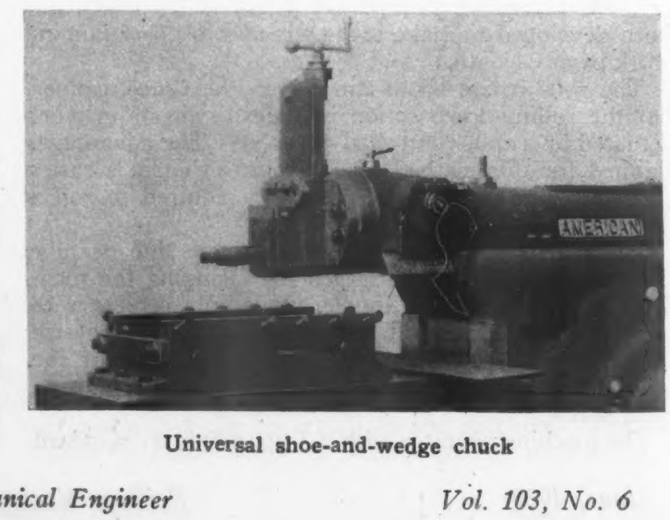
Power traverse for the boring and facing slides is obtained by small motors directly connected by racks and pinions to the slides. The controllers are arranged in a position convenient to the operator, and it takes only a fraction of a minute to run either bar through its entire stroke.

Railroad-Shop Fixtures for Shapers

THE American Tool Works Company, Cincinnati, Ohio, has developed an assortment of attachments for its 32-in. and 36-in. auto-oiled shapers which are specially adapted to locomotive-shop operations. These attachments are a universal shoe-and-wedge chuck, shown in one of the illustrations, a rod-brass attachment, a driving-box planing fixture for shoe and wedge fits which is mounted on a knee-type table designed with a special top for this purpose, and an attachment for planing crown-brass seats, which is also shown in one of the illustrations.

The universal shoe-and-wedge chuck will cover all the requirements of planing shoes and wedges, including the planing of taper fits as well as the final machining to correct the alignments after fitting the shoes and wedges to the frames. The chuck is adjustable for width and is built in two sizes, the smaller size having a maximum capacity of 10 in. width and the larger size, 18 in. width. A movable jaw which provides the width adjustment is secured by bolts and is located by a tongue fitted in a groove in the base. The chuck has an approximate weight of 250 lb.

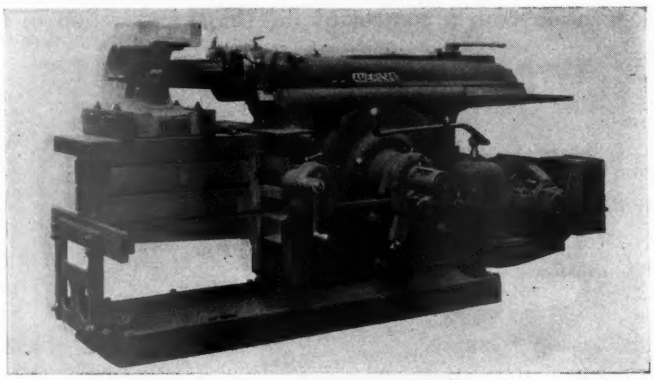
The rod-brass attachment is bolted to the top face of the regular table, and is used for the planing operations on back-end main rod brasses. When the work is mounted on the trunnion the parallel flanges and the taper side fits can be rapidly machined. The trunnion



Universal shoe-and-wedge chuck

is revolved by a hand wheel and is indexed at 90-deg. positions by a sliding plate which engages the square edges of the trunnion block. The tapered face of the brass can be machined by inserting a small wedge between the parts. This attachment has an approximate weight of 175 lb.

The driving-box planing fixture for shoe and wedge fits eliminates two work settings when planing boxes with angular flanges. Instead of having to set the work for each one of the three flange faces, which is necessary when using the customary type of fixture, the work need be set only once with this fixture, as the swiveling feature provides for the flange angles. This fixture is designed for mounting on the knee of a table of special design, the supporting surface of which is dropped sufficiently to provide for the height of the driving-box fixture and work. The table has both power and hand traverse across the rail in either direction, and is elevated and lowered the same as the standard shaper



Attachment for planing crown-brass seats on the American auto-oiled shaper

table, by means of a telescopic screw with heavy ball thrust bearing. The approximate weight of this table is 500 lb.

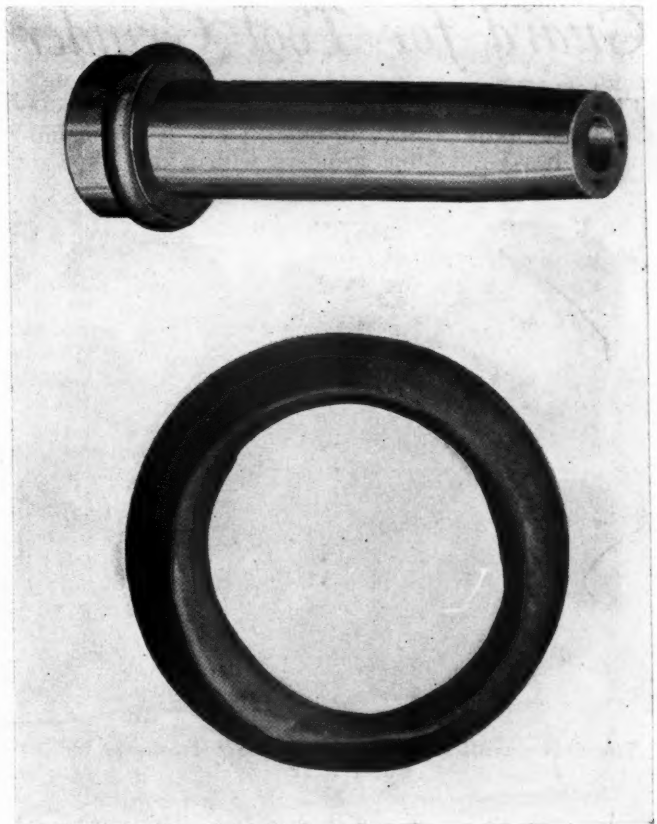
The crown brass planing attachment for planing seats for brasses, is designed to accommodate a full range of driving-box sizes. The extended head is a rigid unit bolted directly to the ram, the revolving member having a full length bearing in the head of the extension. The rotating movement of the head may be secured either by power or by hand. This attachment is interchangeable with the standard shaper head.

Milburn Oxy-Acetylene Rivet-Piercing Tip

THE Alexander Milburn Company, Baltimore, Md., has placed on the market a rivet-piercing tip used with an oxy-acetylene cutting torch which introduces a new method of consuming the head and body of the rivet. The four small holes, shown in the end of the tip body, are the acetylene outlets and the center opening is the outlet for the cutting oxygen.

By centering the tip over the rivet head and preheating the head to a melting point, the head of the rivet is then consumed and the body of the rivet pierced with the cutting oxygen. This leaves the remains of the rivet head in the shape of a ring.

Because of expansion and contraction, the rivet drops out or is backed out with a slight effort. Occasionally the operation does not completely separate the rivet-head ring from the shell of the rivet body, and in this case it is only necessary to tap the ring with a hammer which causes it to drop off immediately. This obviates the use of a chisel.

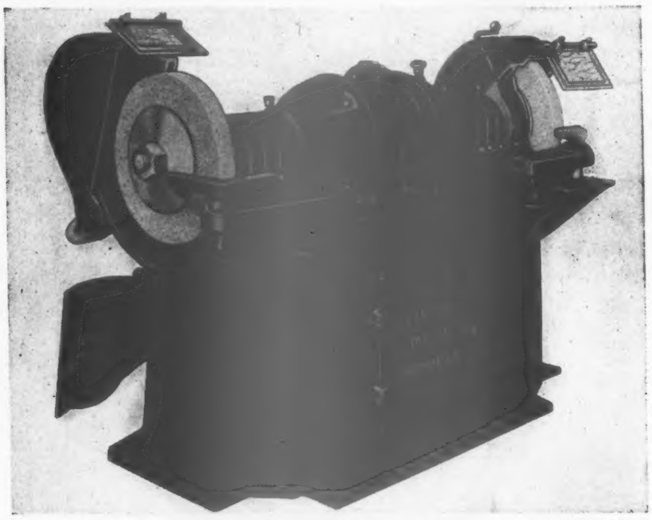


The piercing tip and the remains of a rivet head in the shape of a ring

Cutting out car rivets with the Milburn rivet-piercing tip

Guard for Tool Grinder

THE United States Electrical Tool Company, 2488-96 West Sixth street, Cincinnati, Ohio, is now equipping its heavy-duty tool grinders with a new type of



The dust guards may be adjusted to compensate for wheel wear

wheel guard, shown in the illustration. This guard is made in three pieces. The lower part is provided with an exhaust connection, which is permanently fixed, and is not adjustable. The upper part of the guard is made adjustable to compensate for wheel wear, while the third piece is a hinged door, which is dropped down for the purpose of changing the wheel. Adjustment of the guard to compensate for wheel wear is effected by loosening the threaded clamp which holds the guard and sliding the guard back until it conforms to the new contour of the wheel.

Depth Gage with Protractor Adjustment

RULE depth gage No. 616 recently placed on the market by the Brown & Sharpe Manufacturing Company, Providence, R. I., has the additional feature of use as an easily adjustable protractor. As a protractor, the blade of the gage is easily locked at any angle in relation to the head by the larger of the two clamp nuts on the front side of the head. The turret is graduated every 10 deg. from zero to 90 deg. The smaller clamp nut on the front side of the head locks the blade for use as a depth gage.

Brown & Sharpe depth gage with an easily adjustable protractor

The 6-in. blade is graduated in thirty-seconds and sixty-fourths of an inch English measure or in millimeters and half-millimeters, metric measure.

Low-Pressure Oil Burner

THE Hauck Manufacturing Corporation, 134 Tenth street, Brooklyn, N. Y., has developed a combination Venturi low-pressure burner designed for triple atomization of the oil with air from 8 oz. to 2 lb. pressure, and for use with hot or cold air.

The advantages claimed for this burner are a better atomization with a control of the shape and action of

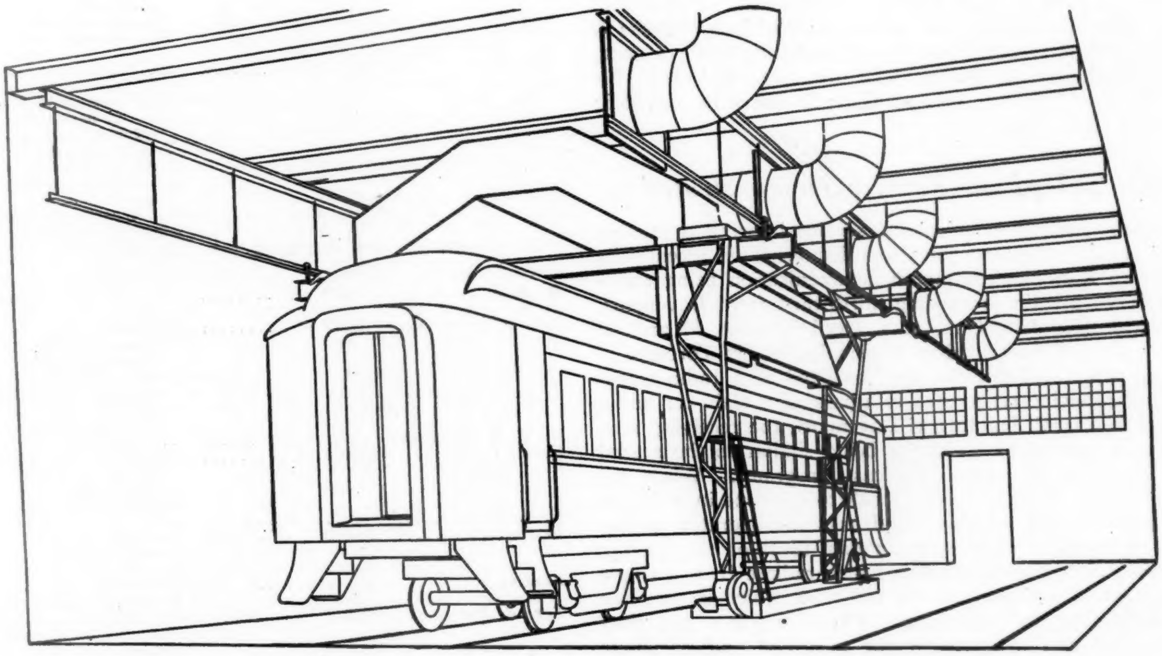
Hauck combination venturi low-pressure burner

the flame. It can be used with highly preheated air without any trouble from carbonization because of the small percentage of cold air flowing along the oil nozzle, and because the atomized oil does not meet the highly preheated air until it leaves the end or tip of the burner. The flame can be lengthened or shortened by shifting a lever without changing the air or oil consumption of the burner.

THE SMOKE PREVENTION ASSOCIATION held its twenty-third annual convention at Kansas City, Mo., on May 14 to 17. During the last three days of the meeting several railroad men addressed the convention. These included J. E. Bjorkholm, assistant superintendent of motive power of the Chicago, Milwaukee, St. Paul & Pacific, whose subject was "Black Smoke and its Prevention"; D. C. Buell of the Railway Educational Bureau at Omaha, Neb., whose subject was "Why Toss your Money out of the Smoke Stack"; Charles Longman, road foreman of engines of the Chicago & North Western, whose subject was "Diesel Locomotive Practice"; J. M. Nicholson, fuel conservation engineer of the Atchison, Topeka & Santa Fe, whose subject was "Proper Operation and Maintenance of Locomotives to Abate Smoke"

Portable Canopy-Type Spray Booth

THE DeVilbiss Company, Toledo, Ohio, has announced a new development in its line of coach-painting ventilating equipment. The new exhaust equipment is portable, which is an additional advantage over previous models of car exhausts manufactured by this company. The operation of this equipment is similar to that described in the August, 1928, issue of the *Railway Mechanical Engineer,* page 474. The portable outfit is simply the stationary type with an overhead chassis and motor-drive added. It is equipped with automatic control and stopping switch. The new feature avoids shifting or spotting cars to a certain location. It is only necessary to move the spray-painting exhaust along the track to the car which is to be painted.



DeVilbiss portable canopy-type exhaust for spray painting

ALEMITE EQUIPMENT FOR RAILROAD USE.—An 18-page catalogue entitled "Alemite Equipment and Parts for Railroad Lubrication", recently issued by the Alemite Corporation, 2650 North Crawford avenue, Chicago, should prove of much value for reference purposes to all railroads now using Alemite fittings and equipment in connection with the pressure lubrication of railroad equipment. Repair parts of the various types of hand and air-operated pressure guns and fittings are listed in detail, giving the part number, correct name and the price of each part. The catalogue is divided into three sections, the first being devoted to Alemite equipment for locomotive lubrication, including rods, motion work, spring rigging, etc. The second section covers the Alemite push-type system for signal equipment and shop lubrication. A third section gives information regarding the parts of a rod compressor and auxiliary rod compressor now obsolete, but of which there are some still in service.

THE MULT-AU-MATIC METHOD.—The Bullard Machine Company, Bridgeport, Conn., describes in a 76-page illustrated catalogue the Bullard Mult-Au-Matic designed for a wide range of work requiring boring, turning, facing, drilling, reaming, threading, grooving and many kindred operations. Briefly, the Mult-Au-Matic, in the respective models comprises four or six independent machines automatically operated in combination on a series of identical pieces in process.

SAMUEL A. HAYDEN, chief clerk to general storekeeper of the Missouri-Kansas-Texas at Parsons, Kans., and A. G. Bohorfoush, chief stock clerk of the Southern Railway at Birmingham, Ala., were declared winners in a contest held during the year by the purchases and stores division of the A.R.A., for papers on the work and problems of the purchasing and stores departments of the railroads. This contest was the third annual contest held by the division and was open to all subordinate officers and employees in railway purchasing and stores work. There were about 35 papers entered in the contest this year. Mr. Hayden's paper is entitled "Improvement Is a Vital Necessity" and Mr. Bohorfoush's paper is entitled "A Standard Method of Calculating Stock Turnover". The two authors will be sent to the annual purchases and stores convention in San Francisco June 24, 25 and 26, to read their papers.

A MECHANICAL PICTURE of one of the Norfolk & Western locomotives will be one of the exhibits in the International Exposition to be held at Seville, Spain, during the spring and summer of this year. H. E. Llampallas, machinist, Roanoke shops, is the man who built the mechanical picture and is sponsoring its entrance among the exhibits of Spain and many foreign countries in the coming exposition. He built his model unaided and during his spare time. Mr. Llampallas calls his model a "mechanical picture" because only half of the locomotive has been built. It is attached to a board, and the representation is carried out perfectly. In addition, the wheels will turn when propelled by an electric motor, giving the observer an accurate idea of the driving mechanism of an actual locomotive. The mechanical picture was made in accordance with and to the scale of the original drawings used in the construction of a real locomotive. The dimensions are in the proportion of 1½ in. to 1 ft. It is 8 ft. long and 2 ft. high. All of the metal, with slight exceptions, is the same kind as is used in the make-up of the locomotives now in service. After the model had been assembled, Mr. Llampallas painted the metal himself.

News of the Month

Shopmen Employed Full Time

A REPORT compiled by the United States Department of Labor shows a greater percentage of full-time employment for machinists during 1927 on the Great Northern than on any other Class I road. During that time the percentage of full-time employment was 98.4. The full-time employment of shop men of other railroads during that time was: Atchison, Topeka & Santa Fe, 98.2 per cent; Louisville & Nashville, 97.2 per cent; Chicago, Burlington & Quincy, 96.8 per cent; Chicago, Milwaukee, St. Paul & Pacific, 95.6 per cent; Southern Pacific, 95.5; Baltimore & Ohio, 94.2.

Train Telephone Service Demonstrated

THE PRACTICABILITY of telephone service between a moving train and regular telephone lines was demonstrated recently by the Canadian National, continuous communication being maintained between a train proceeding northward from Davenport, Ont., toward Allendale, Ont., at a speed between 30 and 40 miles an hour, and the Canadian National offices in Toronto.

The apparatus used for the test consisted of a radio transmitting and receiving set located in a passenger train car and a similar set in a small building at Davenport, the receiving sets, which are in continuous operation, being similar to those used for the reception of radio broadcast programs. When the subscriber on the train wishes to speak to someone in a distant city, he picks up the telephone and asks the operator on the train for the number. The operator then turns on the sending set and sends out ringing impulses which radiate from a single eight-wire aerial, mounted on the car roof, which is used for both transmission and reception. These impulses are then caught up and carried along by the telegraph and telephone lines located along the right-of-way. After being picked off the transmission line at the right-of-way station, they operate a relay which rings a bell, and the operator there turns on his sending set, asks for the call, and puts it through the nearest Bell telephone in the usual way. The voice waves are carried back and forth in the same manner as the ringing wave, the system being what is called carrier-current telephony. The calling of the person on the train is accomplished by a reversal of this process.

It is estimated that the rates for service will not cause an increased charge of more than 20 per cent.

Wage Increases

MECHANICAL department employees on many railroads throughout the country recently have received wage increases of from one to five cents an hour. Negotiations on western roads which have been completed since the publication of the April issue of the *Railway Mechanical Engineer* are as follows:

Road	No. of employees affected	Annual payroll increase	Type of employee	Hourly increase, cents
A. T. & S. F.	11,000	....	Mechanics, helpers and apprentices	5
			Coach cleaners	2
C. & N. W.	10,000	1,200,000	Mechanics	5
			Helpers	3 to 5
			Helper	
			Apprentices	5
			Regular	
			Apprentices	½ to 5
C. B. & Q.	10,000	$1,000,000	....	3 to 5
C. M. St. P. & P.	8,500	1,000,000	....	3 to 5
D. & R. G. W.	2,500	220,000	....	..
K. C. S.	800	....	Mechanics	5
			Helpers and apprentices	3
M-K-T	2,400	....	Mechanics	5
			Semi-skilled mechanics	3 and 4
			Helpers	3
			Apprentices	1 to 5
Mo. Pac.	7,800	750,000	....	3 to 5
Nor. Pac.	5,500	500,000	Mechanics	4 and 5
			Car repairers and inspectors	3 and 4
			Helpers and helper apprentices	3
			Regular apprentices	2
			Miscellaneous laborers	1
So. Pac. (Pacific Lines)	12,000	....	....	2 to 4
So. Pac. (Tex. & La. Lines)	5,000	400,000	Metal craft mechanics	5
			Car builders and inspectors	4
			Freight carmen or car repairers	3
			Locomotive department helpers	1 to 2
			Car department helpers	1
			Apprentices	1 to 4

A resumé of the increases put into effect on other roads since January 1 follows:

B. & M.	2,800	....	....	4
C. R. I. & P. and C. R. I. & G.	7,290	....	Mechanics	5
			Helpers, regular and helper apprentices	3
			Junior helpers, coach cleaners, power plant firemen and other power plant employees	2
N. Y. N. H. & H.	.....	....	....	4
N. Y. C.	16,500	....	Machinists and highest classes of workers in each trade	5
			Coach cleaners	2
N. & W.	.....	....	....	5 per cent
Pennsylvania	36,000	$3,500,000	Principal groups	4
			Carmen	4
			Car cleaners	1
Reading	.....	....	Machinists, etc.	4
			Painters, carpenters, etc.	4
Tex. & Pac.	2,030	206,500	Mechanics	5
			Semi-skilled mechanics	4
			Helpers	3
			Apprentices	1 to 3
Union Pac.	10,787	1,000,000	Mechanics and helpers with more than 18 months' experience	5
			Fourth year apprentices, third year apprentice helpers and third year freight car apprentices	5
			Helpers with less than 18 months' experience, second and third year apprentices, first year apprentice helpers and second year freight car apprentices	3
			First year apprentices and first year freight car apprentices	2
			Second year apprentice helpers	4
			Coach cleaners and other shop forces with more than one year's experience	2
Western Pacific	800	100,000	Mechanics	

Clubs and Associations

The following list gives name of secretaries, dates of next or regular meetings and places of meeting of mechanical associations and railroad clubs.

AIR-BRAKE ASSOCIATION.—T. L. Burton, Room 5605, Grand Central Terminal building, New York.

AMERICAN RAILWAY ASSOCIATION DIVISION V—MECHANICAL.—V. R. Hawthorne, 431 South Dearborn St., Chicago. Annual meeting June 25-28, 1929, at Alexandria Hotel, Los Angeles, Cal.

DIVISION V.—EQUIPMENT PAINTING SECTION.—V. R. Hawthorne, Chicago. Next meeting, Muehlebach Hotel, Kansas City, Mo., September 10-12.

Division VI—Purchases and Stores.—W. J. Farrell, 30 Vesey St., New York. Annual meeting June 24, 25 and 26, 1929, at the Palace Hotel, San Francisco, Cal.

American Railway Tool Foremen's Association.—G. G. Macina, 11402 Calumet avenue, Chicago. Next meeting, September 11-14, 1929, Hotel Sherman, Chicago.

American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. Thirty-ninth St., New York. Railroad Division, Marion B. Richardson, associate editor, *Railway Mechanical Engineer*, 30 Church St., New York.

American Society for Steel Treating.—W. H. Eiseman, 7016 Euclid Ave., Cleveland, Ohio. Annual convention, September 9-13, Cleveland, O.

American Society for Testing Materials.—C. L. Warwick, 1315 Spruce St., Philadelphia, Pa.

American Welding Society.—Miss M. M. Kelly, 29 West Thirty-ninth street, New York.

Association of Railway Electrical Engineers.—Joseph A. Andrucetti, C. & N. W., Room 411, C. & N. W. Station, Chicago, Ill. Annual meeting Hotel Sherman, Chicago, October 22-25.

Canadian Railway Club.—C. R. Crook, 129 Charon St., Montreal, Que. Regular meetings, second Tuesday in each month, except June, July and August, at Windsor Hotel, Montreal, Que.

Car Foremen's Association of Chicago.—G. K. Oliver, 7836 So. Morgan street, Chicago, Ill. Regular meeting second Monday in each month, except June, July and August, Great Northern Hotel, Chicago.

Car Foremen's Association of St. Louis.—F. G. Wiegman, 720 North Twenty-third street, East St. Louis, Mo. Regular meeting first Tuesday in each month, except June, July and August, at Broadview Hotel, East St. Louis, Ill.

Car Foremen's Club of Los Angeles.—J. W. Krause, 514 East Eighth St., Los Angeles, Cal. Meetings second Friday of each month in the Pacific Electric Club building, Los Angeles, Cal.

Central Railway Club.—H. D. Vought, 26 Cortlandt St., New York. Regular meetings second Tuesday each month, expect June, July and August, at Hotel Statler, Buffalo.

Chief Interchange Car Inspectors and Car Foremen's Association.—See Master Car Builders' and Supervisors' Ass'n.

Cincinnati Railway Club.—D. R. Boyd, 3328 Beekman St., Cincinnati. Regular meeting second Tuesday, February, May, September and November.

Cleveland Railway Club.—F. L. Frericks, 14416 Adler Ave., Cleveland, Ohio. Meeting first Monday each month, except July, August and September at Hotel Hollenden, East Sixth and Superior Ave.

International Railroad Master Blacksmiths' Association.—W. J. Mayer, Michigan Central, 2347 Clark Ave., Detroit, Mich. Next meeting, August 20-22, 1929, Fort Shelby Hotel, Detroit.

International Railway Fuel Association.—L. G. Plant, Railway Exchange, 80 E. Jackson Boulevard, Chicago.

International Railway General Foremen's Association.—William Hall, 1061 W. Wabash street, Winona, Minn. Convention September 17-20, inclusive.

Louisiana Car Department Association.—L. Brownlee, 3212 Delachaise street, New Orleans, La. Meetings third Thursday in each month.

Master Boilermakers' Association.—Harry D. Vought, 26 Cortlandt St., New York.

Master Car Builders' and Supervisors' Association.—A. S. Sternberg, master car builder, Belt Railway of Chicago, Chicago. Annual convention September 4, 5 and 6 at the Hotel Sherman, Chicago.

New England Railroad Club.—W. E. Cade, Jr., 683 Atlantic Ave., Boston, Mass. Regular meeting second Tuesday in each month, excepting June, July, August and September, Copley-Plaza Hotel, Boston.

New York Railroad Club.—H. D. Vought, 26 Cortlandt St., New York. Meetings third Friday in each month, except June, July and August, at 29 West Thirty-ninth St., New York.

Pacific Railway Club.—W. S. Wollner, 64 Pine St., San Francisco, Cal. Regular meetings, second Tuesday of each month in San Francisco and Oakland, Cal., alternately.

Railway Car Department Officers' Association.—See Master Car Builders' and Supervisors' Association.

Railway Club of Greenville.—Paul A. Minnis, Bessemer & Lake Erie, Greenville, Pa. Meetings third Thursday of each month, except June, July and August.

Railway Club of Pittsburgh.—J. D. Conway, 515 Grandview Ave., Pittsburgh, Pa. Regular meeting fourth Thursday in month, except June, July and August. Fort Pitt Hotel, Pittsburgh, Pa.

St. Louis Railway Club.—B. W. Frauenthal, M. P. O. Drawer 24, St. Louis, Mo. Regular meetings, second Friday in each month, except June, July and August.

Southern and Southwestern Railway Club.—A. T. Miller. P. O. Box 1205 Atlanta, Ga. Regular meetings third Thursday in January, March, May, July, September and November. Annual meeting third Thursday in November, Ansley Hotel, Atlanta, Ga.

Southwest Master Car Builders' and Supervisors' Association.—See Master Car Builders' & Supervisors' Association.

Traveling Engineers' Association.—W. O. Thompson, 1177 East Ninety-eighth St., Cleveland, Ohio. Annual meeting September 24-28, Hotel Sherman, Chicago.

Western Railway Club.—W. J. Dickinson, 189 West Madison St., Chicago. Regular meetings, third Monday in each month, except June, July and August.

Supply Trade Notes

The Pressed Steel Car Company has moved its Chicago office to suite 625, Peoples Gas building, 122 South Michigan Avenue.

The Alemite Corporation has purchased the Dot lubricator division of the Carr Fastener Company, Cambridge, Mass., and has consolidated it with its railroad department. The Alemite Corporation until recently was known as the Alemite Manufacturing Corporation.

The New York office of the Page Steel & Wire Company has been moved from the Grand Central Terminal building to the New York Central building at 230 Park Ave.

J. D. Wallace & Co., Chicago, has taken over the John T. Towsley Manufacturing Company, Cincinnati, manufacturers of woodworking machinery and factory trucks.

The American Brake Shoe & Foundry Company has moved its office from 30 Church street to the New York Central building, 230 Park avenue, New York City.

The Symington Company and the Gould Coupler Company have moved their New York City office from 250 Park avenue to the New York Central building, 230 Park avenue.

The Johns-Manville Corporation, New York, has moved its western division headquarters from South Michigan avenue and Eighteenth street to 230 North Michigan avenue, Chicago.

Edward F. Carry, president and a director of Pullman, Inc., Chicago, and its subsidiary, the Pullman Company, died suddenly in that city on April 24 from cerebral embolism. Although his health had been failing for some time, Mr. Carry had continued to work in his office until a few days before his death. He was born on May 16, 1867, at Fort Wayne, Ind., and began his business career with the Wells & French Car Company, Chicago, in 1888. He was secretary of this company at the time of its consolidation with the American Car & Foundry Company in 1899. He served the latter company successively for 28 years as district manager, third vice-president, second vice-president, and first vice-president and general manager. He resigned as first vice-president and general manager in 1916 to become president of the Haskell & Barker Car Company. In 1922, when that company was purchased by the Pullman Company, Mr. Carry was elected president.

E. F. Carry

The Industrial Brownhoist Corporation, Cleveland, Ohio, has moved its Pittsburgh, Pa., office from the Oliver building to the new Koppers building. L. Kleinhans will continue in charge of this office.

A. R. Gelinas has been appointed agent for Ontario, Quebec and the maritime provinces for the American Hoist & Derrick Company, St. Paul, Minn. Mr. Gelinas' office is at 1434 St. Catherine street, West, Montreal, Que., Canada.

D. E. Ellis, formerly assistant engineer of motive power, New York Central Lines, has joined the railroad division of the Worthington Pump & Machinery Corporation as eastern district sales manager, with headquarters at the Harrison works, Harrison, N. J.

At a recent meeting of the board of directors of E. F. Houghton & Co., Philadelphia, Pa., Louis E. Murphy was elected president, to succeed Charles E. Carpenter, deceased; A. E. Carpenter was elected first vice-president and treasurer, and George W. Pressell was elected second vice-president and secretary.

The Allen-Bradley Company, Milwaukee, Wis., has opened a district office at 101 Marietta street, Atlanta, Ga. H. Douglas

Stier and G. G. Moore are in charge of this southern office. John McC. Price has been appointed district manager in charge of the Chicago office, 500 North Dearborn street.

Joseph L. Block, Frank R. Meyer, Jr., and Albert C. Roeth, assistant vice-presidents of the Inland Steel Company, have been elected vice-presidents. Charles R. Robinson, vice-president in charge of railroad sales, has been elected a member of the board of directors.

H. B. Spackman has resigned as vice-president and purchasing agent of the Lukens Steel Company, Coatesville, Pa., and has been elected chairman of the executive committee of the board of directors. Hugh Kenworthy, assistant purchasing agent, has been appointed purchasing agent.

William C. Dickerman, who has been elected president of the American Locomotive Company, succeeding W. H. Woodin, was born on December 12, 1874, at Bethlehem, Pa. Following his graduation from Lehigh University in 1896 he entered the employ of the Milton Car Works, Milton, Pa., of which his father was a partner and general manager. He there served successively in the auditing, purchasing and engineering departments. Like Mr. Woodin, Mr. Dickerman was appointed a district manager of the American Car & Foundry Company when the latter absorbed the Milton plant. He served in this capacity at Milton until his transfer to New York in 1900. In 1901 he was appointed sales agent of the American Car & Foundry Company and later, general sales agent. In 1905 he was elected vice-president. During the war Mr. Dickerman was in charge of the American Car & Foundry Company division which successfully executed munitions contracts on behalf of the United States and the allied nations. Since 1919 he has been vice-president in charge of all operations of the company. Among other affiliations he is a director of the American Car & Foundry Company, the American Car & Foundry Securities Company and the J. G. Brill Company.

W. C. Dickerman

C. A. Dunn has been appointed railway representative of the Hutto Engineering Company, 515 Lycaste street, Detroit, Mich. Mr. Dunn was formerly general superintendent of the Globe Steel Tubes Company, Milwaukee, Wis., and prior to that, sales manager of the Prime Manufacturing Company, Milwaukee. He now represents the Hutto line of internal grinding equipment for steam railroad use.

The Central Alloy Steel Corporation, Massillon, Ohio, has installed a large nitriding furnace at its Canton plant. The equipment will be utilized as a service to promote the use of nitralloy. This metal is case-hardened by the nitriding process after it has been made into a finished part. The company plans to place the facilities of the new nitriding furnace at the disposal of manufacturers who, at present, lack such equipment.

The Union Carbide & Carbon Corporation has moved its Chicago district and central division offices to the new Carbide & Carbon building at Michigan avenue and South Water street, Chicago. Units of the Union Carbide & Carbon Corporation which will make this new building their Chicago headquarters are: The Linde Air Products Company, the Prest-O-Lite Company, Inc., Oxweld Acetylene Company, Oxweld Railroad Service Company, Union Carbide Sales Company, Carbide and Carbon Chemicals Corporation, National Carbon Company, Inc., Haynes Stellite Company, J. B. Colt Company and Acheson Graphite Company.

At a recent meeting of the board of directors of the Timken Roller Bearing Company, Canton, Ohio, Marcus T. Lathrop, vice-president and general manager in charge of operation and sales, was elected president of the company, succeeding H. H. Timken, who became chairman of the board; J. W. Spray, vice-president and general sales manager, was elected a director; A. C. Ernst, Cleveland, Ohio, was elected a director and all the previous members of the board of directors were re-elected. Mr. Lathrop has been connected with its affairs for the past 18 years, having started work with the company in 1911 as metallurgist. During his service he has served in various capacities successively in metallurgy, research, in charge of operations and for the last few years as vice-president and general manager in charge of all operations and sales.

Marcus T. Lathrop

Frederick A. Stevenson, assistant vice-president of the American Car & Foundry Company, has been elected a director and vice-president in charge of operations with headquarters at New York. He succeeds, as vice-president, William C. Dickerman, who has been elected president of the American Locomotive Company. Mr. Stevenson's entire business life has been passed in the service of the American Car & Foundry Company. He was born at Detroit, Mich., on April 6, 1880, and after being graduated from high school, he immediately entered the service of the American Car & Foundry Company as a mechanic. Later he was transferred to the Berwick, Pa., plant where he remained until 1907, when he returned to Detroit as master mechanic. In 1916, Mr. Stevenson was appointed assistant general manager, with supervision of the Detroit plant, where large munitions production was being carried on for the Allied Armies. After America entered the war, all the facilities of the American Car & Foundry Company's Detroit and Depew plants were assigned for the manufacture of munitions for the American forces, and Mr. Stevenson was placed in charge of both activities. In August, 1919, he was appointed assistant vice-president and transferred to New York to direct manufacturing at all car plants, foundries and rolling mills operated by the American Car & Foundry Company. Mr. Stevenson is a director also of a number of industrial organizations, including the American Aeronautical Corporation and the American Car & Foundry Motors Company.

Frederick A. Stevenson

John G. Cottle, who has served for the past three years with the Chicago sales force of the Reading Iron Company,

Reading, Pa., has been added to the staff of the railroad department, to fill the vacancy caused by the resignation of H. L. Shepard. Mr. Cottle's headquarters will remain at Chicago. Conrad G. High has been appointed to the sales staff of the Reading Iron Company's Reading district office, and A. C. Knight has been added to the selling staff of the New York office.

NEGOTIATIONS FOR the merger of the Commonwealth Steel Company, Granite City, Ill., with the General Steel Casting Corporation, Philadelphia, Pa., are expected to be concluded in the near future. It is understood that the directors of the Commonwealth Steel Company have already approved the merger and that the stockholders have been asked to give their consent. Robert H. Ripley, senior vice-president of the American Steel Foundries, has been elected also president of the General Steel Castings Corporation.

CHARLES D. MORTON, secretary of the Morton Manufacturing Company, has been elected vice-president to succeed H. H. Schroyer, deceased. Mr. Morton was born in Chicago in June, 1894, and received his early education at Culver Military Academy. He graduated from the University of Wisconsin in 1917 and immediately thereafter entered the army. At the termination of the war, he was serving as a first lieutenant in the fortieth regiment of the fourteenth division of infantry. After the war he entered the employ of the Morton Manufacturing Company and on January 1, 1920, was elected secretary. He continued to serve in this position until his election to the vice-presidency.

Charles D. Morton

THE J. G. BRILL COMPANY, Philadelphia, Pa., manufacturer of electric railway cars and trucks, self-propelled gas-electric and mechanical driven rail cars for steam railroads, and Brill steel diners has recently organized a new division to be known as the Associated Products division under the management of J. C. Robb, with F. O. Paul, formerly automotive service manager, as assistant to the division manager. The new division will control the departments of research and sales extension, and also the manufacture and distribution of new products.

THEODORE WALTER NEWBURN, district engineer of the Westinghouse Air Brake Company at Washington, D. C., died suddenly on April 26, at the age of 53, while on a train en route to the Air Brake Association Convention, at Chicago. After being graduated as a mechanical engineer from Purdue University in 1902, Mr. Newburn entered the employ of the Westinghouse Air Brake Company and served as an inspector and as a mechanical expert until 1914, when he was made assistant district engineer at Pittsburgh. Later he was transferred to Washington, D. C., and promoted to district engineer.

HARRY H. SCHROYER, vice-president of the Morton Manufacturing Company, Chicago, died on May 11, at Hayward, Wis. He was born in Lock Haven, Pa., in 1862 and came to Chicago in 1896 to enter the employ of the Chicago & North Western. He remained with this company until 1903, when he resigned to enter the railway supply field and shortly thereafter to organize the Acme Supply Company. The business continued under his name until 1917, when the corporate name was changed to the Dunbar Manufacturing Company. In November, 1920, the name was again changed to the Morton Manufacturing Company, its present corporate title. Due to failing health, Mr. Schroyer had been inactive in the business of the firm during the past 12 years.

Personal Mention

Master Mechanics and Road Foremen

LUIS V. PEREZ has been appointed master mechanic of the National of Mexico, with headquarters at Guadalajara, Jal.

J. M. PIERCE, master mechanic of the Kansas City Southern at Shreveport, La., has been transferred to Pittsburgh, Kan.

R. M. NUGENT, road foreman of engines of the Chicago & Alton at Slater, Mo., has been appointed master mechanic of the Illinois Terminal system, with headquarters at Alton, Ill.

G. W. CALEY, master mechanic of the New York Central at Corning, N. Y., has been transferred in the same capacity to Utica, N. Y.

A. D. BINGMAM, master mechanic of the New York Central at Utica, N. Y., has been transferred in the same capacity to Harmon, N. Y.

L. W. SHIRLEY has been appointed master mechanic of the Second division of the Oregon-Washington Railroad & Navigation Company, with headquarters at LaGrande, Ore.

F. H. MURRAY, mechanical superintendent of the Erie at Hornell, N. Y., has been appointed district master mechanic. The position of mechanical superintendent has been abolished.

H. M. ALLAN has been appointed division master mechanic in the Alberta district of the Canadian Pacific at Calgary, Alta., succeeding M. W. Boucher.

P. J. MORTON, district foreman of the Union Pacific at Council Bluffs, Ia., has been appointed master mechanic at Kansas City, Kan., succeeding W. J. Kirch.

Z. A. BURRELL, master mechanic of the Union Pacific at Salt Lake City, Utah, has been appointed district foreman, with headquarters at Montpelier, Idaho.

M. W. BOUCHER, division master mechanic in the Alberta district of the Canadian Pacific at Calgary, Alta, has been transferred to the British Columbia district, with headquarters at Revelstoke, B. C.

G. S. WEBB, assistant master mechanic of the Long Island Railroad, has been promoted to the position of assistant master mechanic of the Philadelphia Terminal division of the Pennsylvania.

C. A. WILSON, formerly master mechanic of the Tyrone and Cresson divisions of the Pennsylvania, has been promoted to the position of master mechanic of the Atlantic division, with headquarters at Camden, N. J., succeeding W. B. Porter.

W. J. KIRCH, master mechanic of the Kansas division of the Union Pacific, with headquarters at Kansas City, Kan., has been transferred to Salt Lake City, Utah, succeeding Z. A. Burrell.

FOLLOWING the removal of the repair shops of the National of Mexico from Durango, Dgo., G. L. Alvardo, master mechanic, has been appointed assistant master mechanic at Durango.

D. K. CHASE, master mechanic of the Eastern division of the Pennsylvania, has been promoted to the position of master mechanic of the New York division, with headquarters at Meadows, N. J.

George Thibaut, assistant mechanical superintendent of the Erie at Jersey City, N. J., has been appointed district master mechanic, with headquarters at Seacaucus, N. J. The position of assistant mechanical superintendent has been abolished.

J. Young, Jr., master mechanic of the Williamsport division of the Pennsylvania, has been promoted to the position of master mechanic of the Eastern division, with headquarters at Canton, Ohio, succeeding D. K. Chase.

W. D. Arter, master mechanic of the New York Central at Watertown, N. Y., has been appointed master mechanic, with headquarters at Corning, N. Y. The position of master mechanic at Watertown has been abolished and the duties have been assumed by the division superintendent of motive power.

A. LaMar, master mechanic of the Chicago Terminal division of the Pennsylvania, has been promoted to the position of master mechanic of the Williamsport division, with headquarters at Renova, Pa., succeeding J. Young. Jr.

W. B. Porter, master mechanic of the Atlantic Division of the Pennsylvania, has been promoted to the position of master mechanic of the Chicago Terminal division, with headquarters at Chicago, succeeding A. LaMar.

W. A. Carlson, general master mechanic of the Erie at Hornell, N. Y., has been appointed district master mechanic, with headquarters at Meadville, Pa. The position of general master mechanic has been abolished.

R. V. Blocker, mechanical superintendent of the Erie, with headquarters at Meadville, Pa., has been appointed assistant superintendent of motive power, with headquarters at Hornell, N. Y. The position of mechanical superintendent has been abolished.

Shop and Enginehouse

E. D. Heydt, general foreman of the Missouri Pacific at Osawatomie, Kans., has been transferred to Dupo, Ill.

R. Zillian, enginehouse foreman of the Pennsylvania at Pittsburgh, Pa., has been promoted to the position of enginehouse foreman, Orangeville, Baltimore, Md.

A. E. Walker, assistant machine shop foreman of the Missouri Pacific at Osawatomie, Kan., has been promoted to the position of general foreman.

C. E. Horsley, general foreman of the Illinois Central at East St. Louis, Ill., has been transferred as general foreman to the Twenty-Seventh street shops, Chicago.

Edward Healy, enginehouse foreman of the Chesapeake & Ohio at Nelsonville, Ohio, has been appointed enginehouse foreman, with headquarters at Logan, Ohio.

E. R. Hauer, chief draftsman of the Chesapeake & Ohio, has been appointed assistant shop superintendent, with headquarters at Huntington, W. Va.

Purchases and Stores

R. A. Schuff, storekeeper of the Chicago, Burlington & Quincy at McCook, Neb., has been transferred to Lincoln, Neb., succeeding C. H. Grometer.

C. H. Grometer, storekeeper of the Chicago, Burlington & Quincy at Lincoln, Neb., has been transferred to Creston, Iowa.

G. J. Simbleman has been appointed storekeeper of the Chicago, Burlington & Quincy, with headquarters at McCook, Neb., succeeding R. A. Schuff.

C. H. Vandegrift has been appointed division storekeeper of the Albuquerque division of the Atchison, Topeka & Santa Fe at Gallup, N. M., succeeding A. M. McHenry, who has been transferred to Winslow, Ariz.

H. L. Taylor, assistant purchasing agent of the Western region of the Canadian National, with headquarters at Winnipeg, Man., has been promoted to purchasing agent, with headquarters at Vancouver, B. C.

Car Department

Harry J. Keck, traveling car inspector of the Fort Worth & Denver City, has been appointed general car foreman, with headquarters at Childress, Tex., succeeding H. Fletcher, retired.

Arthur Smith, paint shop foreman of the Missouri Pacific at Parsons, Kan., has been appointed paint shop foreman, with headquarters at Sedalia, Mo.

G. B. Cartwright has been appointed assistant general passenger car foreman of the Missouri Pacific, with headquarters at Sedalia, Mo. Mr. Cartwright was formerly coach shop foreman of the Kansas City, Mexico & Orient at Wichita, Kans.

F. J. Swanson

F. J. Swanson, general car foreman of the Eastern lines of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, has been promoted to district master car builder of the Northern district, with headquarters at Minneapolis, Minn. Mr. Swanson has been connected with the Milwaukee for nearly 25 years. He was born at Chicago on February 15, 1889, and entered railway service on December 26, 1904, as a record clerk on the Milwaukee. During the following 13 years he was advanced successively through the positions of M. C. B. clerk, storekeeper, timekeeper, car repairer, inspector and assistant foreman at the Galewood (Ill.) shops. On October 1, 1917, Mr. Swanson was promoted to car foreman at the Galeswood shops where he remained until March 31, 1925, when he was appointed general car foreman in charge of the Chicago Terminal district.

Obituary

Harry Feather, master mechanic of the Louisville & Nashville, with headquarters at Corbin, Ky., since 1912, died at his home in that city on May 5, following an attack of pneumonia.

William J. Greene, master mechanic of the Duluth, Missabe & Northern with headquarters at Procter, Minn., died at his summer home at Solon Springs, Wis., on May 10, following an illness of several weeks.

T. W. Coe, superintendent of motive power of the New York, Chicago & St. Louis, with headquarters at Cleveland, Ohio, died in St. John's Hospital in that city on May 18, following an operation for appendicitis.

George W. Conway, who retired as general storekeeper of the Louisville & Nashville, in May, 1928, died at his home in Louisville, Ky., on March 15. He had been in the service of the Louisville & Nashville for nearly 47 years.